Compliments of

THE OHIO CORN IMPROVEMENT ASSOCIATION

REPORT OF THE MEETING HELD AT COLUMBUS JANUARY 10-11, 1910, AND FOR THE YEAR 1909

THE EXPERIMENT STATION PRESS
WOOSTER, OHIO
1910

n You Judge Corn ?

If you are a judge of corn or if you are interested in the subject of corn improvement go to the big tent of the

Ohio Corn Improvement Association.

on the State Fair Grounds—east of Agricultural Hall

In forty counties out of the eighty-eight of the state the County Corn Improvement Associations are this season making county corn variety tests in cooperation with the Ohio State Experiment Station. In these tests the best local varieties, with a few of the best outside varieties, are being grown side by side on large test plots. Many of these associations have saved on the cob part of each of the ears of each sample used in the test. These unshelled half-ear samples will show the type of ears and of the variety from which they were selected better than would the whole ears before any corn was shelled from them.

ou do not pretend to be a judge, come and make a guess.

A lot of these samples will be on exhibit in the big tent of the Ohio Corn Improvement Association at the State Fair Grounds. If you can judge corn be sure to see them and record your judgement as to which will be the winner when the plots are husked and weighed this fall. You can acquire more knowledge of corn varieties in a day at this exhibit than you can in a week or a month in many other ways.

Representatives of these County Associations, of the State Association and the Secretary of the National Association, will be there to tell you about the tests and to receive and file your guesses as to test winners. It's a free guess on your part and fair race in the corn test plots.

iio Corn Improvement Association

SUGAR CREEK JIM'S CORN BREEDIN' EXPERIENCE

Some people are like Chinamen;
They don't believe in improvin',
While others are always hustlin' around,
And want to be up and doin'.

This grand old world keeps movin' on
At a very rapid pace;
So we must be up and movin'
Or else get left in the race.

But what I wanted to speak about,
Was concernin' the improvement of corn,
Of the troubles and trials I've had with it,
While livin' on the farm.

I read a number of artikels,
That told jest what to do,
Written by Hartley and Holden,
And some other fellers too.

They told how like begets like
Of protein, oil and germs,
Of barren stalks and pollen and smut,
And many other terms.

I done my best to figger it out
And made up my mind to try,
I determined to raise a better crop
Or find out the reason why.

I found an ear as perfect
As any stalk ever bore,
I know it could not have been beaten,
By Overstreet or Clore.

I wanted to plant it by itself,
Where I knew it couldn't mix,
So I selected a spot by the tater patch,
Where the ground was good and rich.

I 'tended that corn just right, boys!
No one could do any better,
Dust mulch and level cultivation,
Followed everything to the letter.

When that corn had reached the roasting ear stage
One day I went to town,
When I went to feed the hogs that night,
There was one that couldn't be found.

That old sow critter had found the patch
And gobbled two-thirds of the corn,
I was madder then a settin' hen,
I wished she had never been born.

I saved some ears from out the wreck;
They somewhat resembled their mother,
The grains on each ear were just the same
You couldn't tell which from 'tother.

Next year I raised another patch,
And it done tolerable well,
Till that darned old sow got in again,
And didn't leave a smell.

I felt so bad about my loss,
I didn't know what to do,
Till one day when the Farmer came,
I found out something new.

Some feller had sent an artikel in,
That got me like all creation,
I found that the corn I'd been raisin,
Was every blamed one relation.

He proved that the kernels were sisters,
That grew on a single ear,
Then their offsprings of course would be cousins,
Now doesn't that seem queer?

Now we know that the laws of Ohio,
Won't permit first cousins to wed,
Then it surely stands to reason,
Such grains as that shouldn't be bred.

Next year I tried it over again;
I selected an ear of my own;
Then I made a call on a neighbor,
And selected an ear he had grown.

I planted these ears in separate rows;
And when the tassels had grown,
From the one I gently removed them,
And left the other alone.

In order to have the right mixture
And know they were properly bred,
I was careful to pick all my seed ears
From the stalks that were minus their heads.

They say there's a corn school in Pauldin,
With pupils both young and old;
We'd better be up and movin',
Or we'll surely get left in the cold.

Why don't you wake up fellow farmers,
And be ever willin to learn,
Put Sandles is willing to help you,
You'll soon have money to burn.

—SUGAR CREEK JIM.

From the Putnam County Sentinel.

PROCEEDINGS OF THE MEETING OF THE OHIO CORN IMPROVEMENT ASSOCIATION HELD AT COLUMBUS, JANUARY 10-11, 1910

The Second Annual Meeting of the Ohio Corn Improvement Association was held at Columbus, Monday and Tuesday, January 10 and 11, 1910, in connection with the meetings of the Ohio Allied Agricultural Associations. All sessions of the Corn Association meeting were held at the auditorium of the Columbus Chamber of Commerce, with President W. M. Hardman presiding. The State Corn Show was held with the State Apple Show in the large fourth floor of the new Lazarus Building.

At the business session the following counties were officially represented by delegates who were authorized to cast the number of votes indicated:

Name of County	No. Votes	Name of County	No. Votes	Name of County	No. Votes
Brown	3	Greene	9	Morrow	2
Butler	5	Hardin	14	Preble	5
" (Okeana)	6	Knox	14	Putnam	2
Clinton	5	Lake	2	Summit	6
" (Tri. Tp.)	5	Licking	13	Union	2
Columbiana	14	Logan	5	Van Wert	9
Fairfield	10	Meigs	5	Washington	2
Franklin (Pleas. and Jack. Tps.)	3	Madison	1	Wayne	11
Gallia	6	Marion	9	Total votes by 27 counties	173
		Mercer	5		

At the second session on Tuesday the Constitution and By-laws were amended to read as given elsewhere in this volume and the following officers were elected for the ensuing year:

President, W. M. Hardman, Yellow Springs
Vice-President, W. A. Endaly, Middletown
Secretary, L. H. Goddard, Wooster
Treasurer, C. S. French, Salem

Division Vice-Presidents

N. E. Division, E. F. Cranz, Ira
S. E. Division, Wm. H. Sears, Barnesville
W. Cen. Division, Sam'l Taylor, Grove City
N. W. Division, John Begg, Columbus Grove

The following resolutions were adopted by the Association:

RESOLVED, that we ask the legislature to appropriate through the Ohio State University funds sufficient to enlarge and extend the Agricultural Extension Schools.

RESOLVED, that we heartily endorse the work of the Ohio Experiment Station in their experimental and demonstrational work.

RESOLVED, that we, the Ohio Corn Improvement Association, recommend to the General Assembly of Ohio the enactment of a law making it the duty of the State Commissioner of Common Schools to formulate a course of study in Elementary Agriculture for the Elementary Schools of Ohio, and that the teaching of said course be made mandatory.

RESOLVED, that whenever a majority of the counties composing any subdivision of the Association which exists now or may hereafter be created, shall desire to hold a meeting of the Ohio Corn Improvement Association within their division, this wish shall be communicated through the Vice-President of the district to the Secretary of the State Association. The President of the State Association may thereupon, with the advice and consent of the Executive Committee, appoint a committee of four, of whom the District Vice-President shall be chairman, who shall have charge of all details of the proposed meeting.

RESOLVED, that whenever it shall have been decided to hold a meeting as hereinbefore provided, the Executive Committee shall appropriate from the unincumbered funds of the Association any amount not to exceed one-third of the total amount of said funds, which shall be available for promotion of the proposed meeting, to the committee hereinbefore appointed. Not more than one meeting of the State Association shall be held in any subdivision of the State within twelve months.

RESOLVED, that hereafter corn at state Shows must be judged by divisions.

WHEREAS, the National Corn Exposition is one of the greatest agricultural educational movements in the United States, and

WHEREAS, the States and territory adjacent to the city in which this Exposition is held, will receive the greatest good therefrom, and

WHEREAS, there is a possibility of securing the fourth annual Corn Exposition for the city of Columbus,

RESOLVED, that we, the Ohio Corn Improvement Association, favor having this Exposition in the city of Columbus, and place ourselves on record to be of any service desired toward making the Exposition the greatest possible success, and further, in order to concentrate all our efforts to this end, we agree to hold our State Show at the same time and place as the National Corn Exposition, providing it is held in Ohio.

Upon invitation of the Association the members of the General Assembly visited the Corn Show on Tuesday, January 11th.

In the absence of the Committee on State divisions, Mr. W. A. Lloyd presented the fact that the bulk of the premiums had been won by twenty-seven counties in both the first and second annual State Corn Shows and moved that the state be divided into four divisions so arranged that these twenty-seven counties be in a division by themselves. The divisions adopted were as follows:

NORTH-EAST DIVISION

Ashland	Erie	Lorain	Richland	Wayne
Ashtabula	Geauga	Mahoning	Stark	
Columbiana	Huron	Medina	Summit	
Cuyahoga	Lake	Portage	Trumbull	

SOUTH-EAST DIVISION

Adams	Coshocton	Hocking	Monroe	Scioto
Athens	Gallia	Holmes	Morgan	Tuscarawas
Belmont	Guernsey	Jackson	Muskingum	Vinton
Brown	Hamilton	Jefferson	Noble	Washington
Carroll	Harrison	Lawrence	Perry	
Clermont	Highland	Meigs	Pike	

WEST-CENTRAL DIVISION

Butler	Fairfield	Logan	Morrow	Union
Champaign	Fayette	Madison	Paulding	Van Wert
Clarke	Franklin	Marion	Pickaway	Warren
Clinton	Greene	Mercer	Preble	
Darke	Knox	Miami	Ross	
Delaware	Licking	Montgomery	Shelby	

NORTH-WEST DIVISION

Allen	Defiance	Henry	Putnam	Wood
Auglaize	Fulton	Lucas	Sandusky	Wyandot
Crawford	Hancock	Ottawa	Seneca	
	Hardin		Williams	

The following papers and reports were presented at the various sessions of the meeting:

ADDRESS OF THE PRESIDENT

W. M. HARDMAN, YELLOW SPRINGS

Members of the Association, Ladies and Gentlemen:

We are assembled here this afternoon to open exercises incident to the Second Annual Meeting of the Ohio Corn Improvement Association and to commemorate its organization. It is probably not assuming too much to say that if plans already outlined are successful, they will result in adding very materially to the wealth of the State, and in that case Ohio will ever owe a debt of gratitude to the originators of this movement.

A committee was appointed by the Ohio Plant Breeders' Association in June, 1907, for the purpose of submitting plans looking to the organization of a State Corn Association. As a result of that effort, there responded to a call for an organization meeting January 15th, 1908, 161 delegates representing 54 counties, at which meeting the organization of the Ohio Corn Improvement Association was affected. While the Plant Breeders' Association was instrumental in the organization of the Corn Association, yet they are two separate and distinct organizations.

There are now Associations in about fifty counties, with a total membership of over 3000. That may seem almost phenomenal for two years' growth, yet when we consider that in Ohio we have approximately 275,000 farms and consequently about the same number of farmers, we have slightly over one percent of them enrolled as members of the various County Associations. We have as it were just broken ground for the erection of a massive structure. There should be an organization in each county, and when some central point is not easily accessible there should be two or more. With united effort and some wide-awake hustling it is possible to increase our membership to 50,000 in the next two years. Much of the progress that has been made in the work is due to the untiring efforts of our Secretary, Mr. Goddard, and the Association owes him an acknowledgement of its grateful appreciation.

The researches of the Experiment Station are enabling the farmer to meet the demand of a growing population for increased quantities of his product, and it is most important that these researches continue until every feature of interest in soils, plants and animals has due attention. The value of the work of our Experiment Station and State University to the agricultural interests of Ohio could not be estimated in dollars, but suffice to say that it is worthy of the earnest support and hearty cooperation of the entire State. The farming community as a class do not keep in sufficiently close touch with the Station Staff or their work to get the greatest good from it.

As you have been advised through circulars, the purpose of this organization is to improve Ohio's corn crop in quantity and quality. To insure marked progress along this line, there are a number of points to which careful attention should be given by the grower, some of the more important being:

First, a close partnership with nature;
Second, careful selection and care of seed;
Third, individual ear germination test;
Fourth, the ear row test to find the high-yielding ears; and
Fifth, the best rotation, and the practical use of manure and fertilizers to maintain fertility.

At a meeting of the Executive Committee during the Field Meeting at Wooster, September 9th and 10th, 1909, there was an effort made to formulate plans for a Corn Contest, by offering liberal premiums for the best 10-year average yield from 10 acres of land. The idea was to stimulate individual effort. The necessary support did not seem to be forthcoming and the matter has been dropped for the present.

A better idea of the scope covered by the work of the Association may be had from the following list of subjects now being considered:

Selecting and Introducing Varieties
Rotations and Fertilizers
Marketing
Score Card and Corn Judging
Tools and Methods
Local Associations
Legislation
Improving Varieties
Silage Varieties and Methods
Public School Work
State Divisions
Utilization
Institutes and Expositions
Educational Trains

A report from the Chairman of the Committee on each of the foregoing subjects will be given sometime during this series of meetings.

The County Corn Variety Test is a work that has made the most perceptible progress in point of real value of any line yet taken up, fourteen of these having been conducted the past year. The first step in corn improvement is to find the variety that seems best adapted to the particular section in which it is to be grown. This is why we mentioned the County Variety Tests that were conducted the past year as being probably the most important feature of the work of the Association up to this time. When the variety question has been decided, then proceed to improve that variety in quality and yield by careful seed selection and the ear row test. There has been marked improvement made through selection and care of the seed, the germination test and the use of the grader to secure a uniform stand.

We wish to emphasize the importance of the ear row test to every corn grower in Ohio. With actual experience as a basis for our judgment, we believe it is possible to increase the average yield ten bushels per acre in five years if each farmer growing twenty acres or more will take up this work. Much of the detail incident to corn breeding may be omitted from the test and still be effective in increasing the yield. The test is the only possible means of determining whether the beautiful show ear or the apparently less desirable ear that has been discarded, is the higher yielder. So let us not be over-zealous in our efforts to grow show corn at the cost of some more important features.

It is not my province to discourage or speak disparagingly of the corn show; it has a place, and from an educational point of view it is most important. Our Show this year is somewhat short of last year in the number of entries, but of the quality of the exhibits Ohio can justly feel proud. It might be well to state just here that Ohio has a fairly good chance of securing the next National Corn Exposition.

Maintaining the fertility of the soil is a problem that will confront the corn grower with ever increasing importance as the virgin qualities become exhausted. This is one of the factors that is making agriculture in this country at present what may well be termed an intellectual profession, and as a natural consequence there is a growing demand for trained minds to profitably conduct it. In the education of the farmer rests the solution of the various problems now confronting American agriculture. If, as has been suggested, Ohio is to continue to lead in the average yield of corn per acre, it will be necessary to harness and press into service every available opportunity along lines of progress. Though many of our farmers may have the inclination, they have hardly the time to devote to the necessary tests and experimental work so essential to improvement. If there was any way possible to utilize the infirmary farms of the State for that purpose and keep the management out of the reach of political jobbery, it would seem to be a forward step.

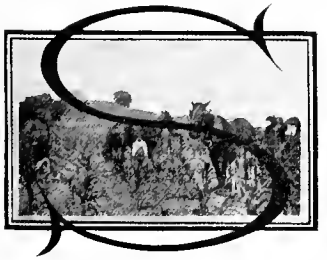
From even a casual examination of statistics it will be readily seen that American corn is a very important factor in the life of almost this entire universe. With the United States producing about four-fifths of the corn of the world and the State of Illinois alone almost one-half as much as the entire world outside of the United States, do we who live in the corn belt of this nation appreciate the significance of that expression so commonly used, "Corn is King"? It is a self-evident fact that the area of the world adapted to profitable corn culture is very limited, and that the time is not very far distant when the corn area will of necessity be utilized for corn.

The total corn crop of the United States for 1909 may be roughly estimated at two and three-quarters billion bushels. Let us consider for a moment how much that would be. If it were loaded in cars, one thousand bushels to a car and the cars put into trains of fifty cars each, it would make fifty-five thousand trains, or if placed in one continuous train would reach over fifteen thousand miles, about five times the distance from San Francisco to New York City. With our population increasing rapidly by birth and immigration, and a continuous influx of country people to the towns and cities, thus changing from producers to consumers, it would seem that the farmer need have no fear of any immediate collapse in the selling price of his product. In fact, the present indications are that the hour of the high tide has not yet come to the American farmer.

The Agricultural College Trophy Cup

REPORT OF COMMITTEE ON TOOLS AND METHODS

H. C. Ramsower, O. S. U., Columbus
H. C. George, Okeana
W. J. Edgerton, Barnesville
L. W. Ellis, U. S. D. A., Washington
Frank B. Rarey, Kenton
J. W. Linebaugh, Grove City
O. L. Shank, Germantown



INCE the report of this committee before the Ohio Corn Improvement Association a year ago, some little progress has been made. The Chairman of the Committee had the privilege during the past summer, as an employee of the Ohio Experiment Station, of traveling about among the farmers of different parts of the state, ascertaining their practice in regard to tools and methods in use, noting their successes and their failures, learning what we could and in what way we might. In addition, we have examined the reports of scores of others whom we did not visit—reports sent in in response to inquiries circulated within the last year or so by the Experiment Station.

The investigation has not been carried sufficiently far to say what tools are most satisfactory or what methods most practical, but a review of our findings may be both interesting and profitable.

MANURE SPREADERS

We are coming more and more to feel the necessity of getting out the manure as soon as made, and to appreciate the great advantage of the manure spreader. There are a great many who feel that they can hardly afford to buy for the small amount of manure which they make, and yet the unqualified testimony of the farmer with even a small amount of manure to haul, is in favor of the spreader.

A great deal, perhaps one-third, is saved in labor, but the greater efficiency of the spreading far outweighs the saving in labor. No man, no matter how particular he may be, can spread by hand and get the ground covered uniformly, and in nearly every case the manure will be put on thicker than is necessary. The spreader will make the manure go at least one-half farther and with better results. Then, too, the spreader is always ready for its work. It cannot be used for anything else, and this is one reason why we are not ready to recommend the removable box type of spreader. While this may give good satisfaction for a time, the construction must be such that it will scarcely prove of a lasting quality, and it will not be in readiness when needed. The demand upon the strength of a spreader is great, and every part must be strong and substantially built.

Opinion is divided between the endless apron and return apron type of box, as also between the worm gear and ratchet drive for the apron. The simple machine in any case is always to be preferred to one of more complex build. The additional mechanism for running back the return apron means more gears to wear, more nuts to become loosened, more castings to break. With intelligent operation this mechanism will easily last through the life of the spreader, but hired hands are not always mechanics. The return apron, on the other hand, with the front endgate moving back with the load will distribute all of the manure at the finish at a uniform rate, while with the endless apron there is always some manure left in the bed and more or less uneven spreading at the finish.

The greatest objection to the worm gear drive for the apron is that it is difficult to keep it well oiled, hence there is great wear in the gears. Some have been known to wear out in a single day. On the other hand, they give a steady, uniform drive to the apron both up-hill and down. The ratchet drive is not subject to so much wear but does not give a uniform rotation to the apron, and in drawing the load up a steep hill there is a tendency to feed faster unless the apron is provided with a good break. Being less likely to wear out rapidly, it will give better results in the hands of the average operator than will any other drive.

While the great majority are hauling their stable manure direct to the field and spreading it, some few still persist in throwing it out in a pile in sunshine and rain losing its goodness to the nearby stream, or perhaps to haul it out and carefully deposit it in little piles for later distribution, thus fertilizing their land in spots. Some object to the spreader saying that they cannot use it every day in the year. While there may be some days in winter when the spreader cannot be used, these are so few that this argument should not be used against it.

The common custom is to spread the manure on lands to be plowed for corn the following season. The practice is good, but there are some who have for some years spread the bulk of their manure on meadow land from which one crop of grass is to be cut followed by corn, and the result is very gratifying. A splendid loose sod is thus turned under giving an excellent seed bed for the corn, while both grass and corn are greatly benefitted. The growing grass conserves important constituents in the manure, and while the grass gets first benefit, the effects are carried over to the succeeding crop of corn. We have no figures to prove that one method is better than the other, and we believe that there is but little difference in the end.

In southeastern Ohio where commercial fertilizers are used on the corn land, sowing it by means of fertilizer attachments in the hill or row, is common practice. This method of application is to be discouraged, for though the fertilizer is spread by rains throughout the soil, if wheat follows the corn, the corn row can easily be traced by a row of better wheat. A better plan is to broad-cast the fertilizer, or put on with a grain drill thus feeding the land all alike and the fine corn roots filling the whole surface soil will absorb as much plant food, perhaps more, than when drilled in the row.

PLOWS AND PLOWING

The lasting benefits to be derived from fall plowing, or plowing in early winter, do not seem to be understood or appreciated as they should. Several fields coming under our personal observation this summer, served to impress the value of early plowing. In one field located in the clayey soil of Wayne County, we could tell almost to the row where the fall plowed ground stopped and the spring plowed began. The corn was larger, the color better, the stand far more perfect on the fall-plowed part. The owner stated that he was enabled to work the ground much earlier in the spring. It was prepared with less labor and the grubworms which thrived in the spring plowed soil were almost entirely absent in the fall plowed. Another field in Stark County, a clay field, too, showed the same result. Other fields might be mentioned on widely different soil types with no less favorable results.

The reason is not far to seek. The fall or early winter plowing drops a sponge, as it were, down upon the soil. The falling rains are absorbed and then stored up in the subsoil. Spring comes with its drying winds and warming sun, but our sponge prevents the too rapid drawing up of the water from below to be evaporated from the surface. With the hard, unmoved surface soil in place there is a constant and unobstructed flow of the water up from beneath resulting in the loss of tons of water, which if kept in the soil would be a boon to the growing crop in August. But this is not all. It takes heat to evaporate water, and the sun's rays spent in evaporating great amounts of water from the surface will be of little avail in warming up the soil. If the supply from the ground water beneath is broken by our sponge, the heat of the sun will be used in warming the soil with the result that a fit bed for spring planting will be more quickly obtained. Then, too, there is no better agency than freezing and thawing for finely pulverizing the soil. Insects and weed seeds are killed and destroyed.

True the fall plowed ground will pack, but it will seldom, except in the most tenaceous clay soils, reach its former state of hardness. We hesitate to advise the indiscriminate use of the plow in the fall for there are times and soils and topographies which would not allow it, but we do say that its benefits are great in most cases and its results should be more thoroughly studied.

But few of us plow as deep as we think. Time and again farmers told us that they were plowing eight inches deep when investigation disclosed that they were plowing scant six. An eight inch furrow is a deep one, and is reached by comparatively few farmers. Here, again, judgment must be used, but the old adage "Plow deep while sluggards sleep, and you'll have corn to sell and keep" is not without its fitting application. Let's get down into the soil and thus increase the well aerated feeding area for the corn roots. Increase the depth slowly each year if need be, but increase it to the maximum which your soil will allow.

The sulky plow is being more extensively used each year. We are glad to note this. While around corners, perhaps, they may not be so good from the standpoint of efficient plowing, in general a more uniform and deeper furrow will be turned than with the walking plow. The draft is only slightly greater, but the increased ease with which the operator does the work is a point of no mean consideration. With the sulky plow one finishes the day's work free from that deadening weariness which follows miles of furrow tramping with a mind more capable of performing other tasks and a job of plowing well done.

We have had occasion to note several fields of sod which had been plowed without a jointer, and in every case we saw a field poorly plowed. Grass could be seen on nearly every furrow where there should have been only well pulverized soil, and manure and trash, if there were any, showed plainly on top of the ground. The usefulness of the jointer leads us to say without qualification that a plow equipped for sod plowing is incomplete without it. There seems to be a prevalent idea that the rolling coulter will replace the jointer, but this is not true. The only function of the coulter is to cut the furrow slice from the land while the jointer does this to a limited extent and turns its little furrow as well. This furrow effectively turns under the grass growing up between the furrow slices and leaves the furrow's edge lying in the best possible position for the subsequent use of the harrow.

The disc plow is used chiefly in the fall, where the ground is dry and hard. It can be used where it is almost impossible to turn a furrow with a moldboard plow, but, as a usual thing, the furrow

slice is not so nicely turned. There are a few disc plows on the market capable of plowing to a depth of eighteen or twenty inches. The discs are large and they turn a good furrow, effectively covering any trash. The merits of this excessively deep plowing must be thoroughly tested before it can be recommended for general practice.

HARROWS AND HARROWING

In regard to working the soil after plowing there is wide variation in custom. There are some who, in spring plowing, follow the plow with the harrow each day. If the soil is dry enough to permit, this is wise, because the sooner an effective mulch is established on top the better because, there is no moisture to waste through evaporation. If the soil is a little wet in plowing so that the furrow slice turns up smooth and shining, it should be harrowed just as soon as dry enough to stir and not left, as is the common custom, to dry and bake in the wind and sun. There are harrow attachments made in disc and spiketooth types which follow the sulky plow pulverizing and smoothing each furrow as it is turned. We have seen these working in the West with entire satisfaction. Fall or winter plowing is better left unharrowed. It will not become so compact and is more open to action of freezing and thawing, and will be in better shape for the use of harrows in the spring.

The disc harrow in combination with the spiketooth is the most common outfit found. There is a double disc lately put upon the market which gives promise of making a very useful tool. It consists of two sets of discs, one following the other in such a way that all the soil is stirred and left in a very level condition—two harrows in one requiring three or more good horses to operate, but effective and saving of labor. Put on four horses, if necessary, for horsepower is more easily controlled and more easily and cheaply obtained than labor.

The springtooth harrow is very efficient as a pulverizer and can be made to run at almost any depth. In stony soil it is far better than the disc and is largely used there.

On sod ground the first tool used by some farmers is the roller. This is effective chiefly to press the sod home and prevent its being torn up by the harrow. The roller may also be used in very dry seasons to firm the soil, but it should in most cases be closely followed by the harrow, otherwise there will be considerable moisture lost. The drag is more effective as a clod crusher and is more safely used. One of the best kinds of drag is made of four 4x4's of the proper length bolted together with one corner of each piece resting on the ground. It is far more efficient than the ordinary plank drag.

PLANTERS AND PLANTING

The edge-drop corn planter is fast replacing the old style full-hill drop. A higher percentage of accuracy is usually obtained with it because there is less variation in the thickness of kernels than in any other dimension. We have found, however, that unless the corn is well graded considerable trouble will be met with. If there are too many small kernels, two of these will slip down endwise into the cell and when they come to the knockoff spring, will be broken in two. This is the cause of frequent cracked kernels when using the edgedrop planter and can be largely done away with by the use of a good hand grader.

In spite of all that has been said regarding the testing of planters to determine the proper plate to use, there are very few who pay any attention whatever to this important step. If you were checking a field of 25 acres, 3 feet, 6 inches apart each way and your planter would miss one kernel every third hill, how much would be lost? Assuming three stalks as a perfect hill, and that every stalk will produce one ear 100 of which will make a bushel, there would be a loss of 300 bushels in the whole field. It is worth while, is it not, to do all in our power to secure a perfect stand? A planter dropping 85 perfect hills in a hundred is doing exceptionally well, and the average planter is far below this. Manufacturers are doing the best they can to give us an accurate drop and if our efforts were only as strenuous as theirs, results would be more satisfactory.

The disc furrow opener is used to a limited extent. We believe there is small argument for its use. True it will penetrate better than the shoe, but if the ground is so hard as to require a sharp disc to open up a furrow for the corn, better hitch to the disc harrow and not rely on the planter to both prepare the soil and plant the corn. There is danger, also, in its use in mellow soil of getting the corn too deep. The disc does not excel the shoe as a means of covering the corn in any way except in point of penetration.

CULTIVATORS AND CULTIVATING

"I cultivate my corn before I plant it," was the statement of one successful farmer, and in this statement there is a great deal of truth. But after it is planted one must not cease to be vigilant. Many are strong in their belief that the best tending the corn gets is the harrowing given just before or just after it is up. The weeder serves practically the same purpose as the harrow and in some cases it may be better. However, the harrow seems to be preferred by many, the claim being made that the weeder often goes too deep and cannot be governed as well as the harrow. A weeder with wheels obviates this difficulty.

"How deep do you cultivate?" was one of the questions invariably asked, and the answer was occasionally given—"As deep as I can throughout the season." A visit to the field of one man who made such an answer easily proved to us that his practice was wrong. The roots were too much disturbed, and the result was stunted corn. Deep the first time is the general rule with shallower cultivation following. If the seed bed has been carefully prepared it is not the purpose of the cultivation to *plow* the soil but rather to kill surface weeds, and keep a good fine mulch on top. Three inches is sufficient for this, and the cultivator with three to six small shovels on each gang is more efficient than one with two wider shovels. In fact, a cultivator of the latter type is now seldom seen, and if it is, one immediately suspects that the owner is somewhat behind the times.

If all the work could be done at just the proper time we should stir the soil as soon after each rain as the land will permit, thus breaking the crust on top and preventing the evaporation of water. If this practice is followed after the light showers of July much benefit will be derived therefrom. After the corn is "laid by," the question is often asked, "Does it pay to plow with a one horse cultivator?" Certainly the ground now well shaded does not need much stirring, but after each rain a crust is found to form and this should be broken in some way. One of the best corn growers in Fayette County practiced going through the corn with a small drag having nails driven through the rear end, thus effectively breaking the crust and leaving the surface in proper condition.

There is still considerable prejudice against the use of the riding cultivator and the prejudice is well founded. It scarcely stands to reason that one can do as good a job when riding as when walking, though if the operator is careful he can do an acceptable piece of work. However, it is hard work following a walking plow day after day, and most of us are willing to sacrifice a little in the quality of the job to secure this greater comfort. There are many kinds of plows on the market including the pivot axle, with its rigid gangs, guiding being done entirely with the feet by steering the wheels, thus throwing the whole plow to right or left. This plow is easily controlled, but one must be quick in operating when plowing corn at all crooked. The pivot gang type on the other hand has a rigid axle but movable gangs controlled entirely by the feet. This gives the best of satisfaction, and is easily controlled. The hammock seat type is controlled by both hands and feet, the feet controlling the gangs directly and not through a pivot as in the two former makes. Each make has its followers and any of them will do good work.

The two-row cultivator is used to a limited extent in Ohio. Some whose experiences we have are satisfied with the work done—others are not. Where the ground is clean, rows straight and long, this tool may have a place, but the average Ohio farmer would scarcely be justified in buying.

CUTTING

The great majority of our corn is and for some time to come will be cut by hand. While the International Harvester Company claims to have sold more corn binders last year than ever before in their history, our own observation would indicate that they are not so popular as they were three or four years ago. Many have been bought and tried with more or less dissatisfaction, and are now standing idle. Scarcity of labor seems to be the chief cause leading farmers to buy and once bought the most common objection raised against them is that it is almost impossible to get men to set up after them. Undoubtedly the work is hard, as all who have done it can testify, but hired hands object to working by the day when they can make more, perhaps, cutting by the shock. Acre for acre most any one would prefer to set up rather than cut by hand.

There does not seem to be a great deal of difference in the cost either way. Seven acres is considered a good day's work for team and driver, with two men setting up and on this basis one man figures thus:

Two hands	$5.00
One driver	2.00
Twine	2.80
Horses and machine	2.10
	$11.90

This makes a total of $11.90, or $1.70 per acre, compared to $1.98 per acre by hand under this farmer's conditions. But if interest on investment, depreciation of machine, etc. is considered the cost is still higher. Consider that we have 40 acres of corn each season, then with interest at 6 percent and depreciation at 10 percent of machine's value, we would have for a day's work of seven acres:

Two hands	$5.00
Team and driver	3.50
Twine	2.80
Interest and depreciation	3.50
	$14.80

This makes $14.80 or $2.11 per acre, which is more accurate figuring than the above. These items will vary with the size of crop, amount of twine, and the valuation each farmer puts on his own labor or that of his team.

On the other hand, with labor almost impossible to get, and with work quickly done to make ready for seeding, the arguments are not all against the machine. The quality of work is not all that

could be desired, and the neat and saving farmer finds in this his most serious objection. For the man with a silo to fill or for one who practices husking and shredding, the binder is most useful.

The shocker can scarcely be considered successful. There are many in Ohio standing out behind the barns or in sheds, the owners refusing to use them. Though the inventors were working to improve the shocker before the binder came into general use, their efforts have not been so successful. It is thought that if the shocks could be made larger and with a larger bottom, they would stand up better. The shocker will undoubtedly see more and better improvements in the future, but until they come the farmer will scarcely be justified in purchasing.

Where the corn stands up well the sled cutter is a very cheap and satisfactory method for cutting the corn. With two good men on the sled, one hundred shocks per day is only a fair day's work and many men would easily cut one hundred and fifty.

H. C. Ramsower, Chairman

The American Agriculturist Trophy Cup

REPORT OF THE COMMITTEE ON SELECTION AND INTRODUCTION OF VARIETIES OF CORN

Gail T. Abbott, O. A. E. S., Wooster
A. B. Cross, Racine
H. M. Dill, Lebanon
F. C. Murphy, Sunbury
Ira L. Graham, Payne
G. S. Nuding, Mendon
W. H. Hart, Oberlin

That varieties of corn differ greatly in many respects will be apparent to any one who gives even a casual glance at a collection gathered from the different sections of our own State. Your committee has undertaken to collect samples representing the more common varieties grown in each county.

The members of the Corn Improvement Associations have rendered most valuable aid in this work, not only by answering a rather tiresome list of questions contained in a report blank sent out to about 1700 persons, but also by sending in, when requested, ten ear samples of the corn they are growing. The hearty cooperation in the work of this investigation is not confined to the members of the associations, however, since we have many reports from other corn growers and also a very valuable collection of reports from a list of grain dealers well distributed over the State. We realize that we have a very incomplete collection, and that our studies of the varieties have but just begun. We hope, however, that each corn grower who visits the show will make a very careful study of these, since, though incomplete, they tell some things much more plainly than can a report.

You will note a difference not only in color, shape and size of the ear, but also in the depth and roughness of the kernels as well. What is the cause of these variations? They are due, we believe, to two agencies or forces; the first we shall call the influence on all plant and animal life exerted by its environment. Plants have a wonderful power of accommodating themselves to the conditions under which they are compelled to grow, which we call adaptability. A difference in soil or climate will produce a change not only in the size and general appearance of the ear, but also in size and shape of kernel.

Perhaps the exhibit of about 30 ears of Reid's Yellow Dent, gathered from all parts of Ohio, will illustrate what we mean. Starting in the southern part of the State we find that the size of the ear slowly decreases as we move northward. The shorter growing season of northern Ohio will not produce as large ears as can be grown in the central and southern parts of the State. The samples of varieties of corn grown in Butler county when compared with those grown in Sandusky will illustrate this point. It has also been

observed by corn growers that moving a variety from a rich soil to a thin one produces the same effect. Compare the samples grown on the rich comparatively new land of VanWert and Paulding counties with those from the older thinner soils of Portage and Ashtabula.

Referring again to our row of ears of Reid's Yellow Dent we note another thing: As we travel northward or move from the very rich newer sections to the older parts of the state in the same latitude, we shall find the rougher type of corn with its more or less chaffy tip giving way to a smoother type of kernel. In southern Ohio we find a rougher type growing in the rich valleys of the Scioto or Miami than on the hills; or on the thinner soils of parts of Highland, Clermont, Brown and Adams counties. In the northern part of the State we find the same thing when we consider the corn grown on the rich black soil of northern VanWert, Paulding and southern Defiance, which counties were among the last in Ohio to be redeemed from the swamps that formerly covered that part of the state, in comparison with those grown on the older and less productive soils of the counties lying eastward. Eighty-five percent of the farmers' reports indicate that the rougher type is best adapted to rich land, and about the same percent think that a smooth type is best for thin land. As one man stated it, "My corn was pretty chaffy this year for I grew it on new ground."

We find also that the kernels grow *shorter* as we travel northward or move from the richer to the thinner soil. The practical application of this is that the corn grower of northern and especially northeastern Ohio, particularly if he has a farm with a rather thin soil, cannot expect to produce the large eared, deep grained and rougher dented types of corn that are at home in the more favored sections of the state, and furthermore if he does attempt it, nature herself will in time cause them to conform to the type adapted to his soil and climate.

The other influence that helps to change the appearance and type of corn, is that exerted by the hand of man. By continually working with one idea in mind and always selecting ears that conform to his ideal, a man may in time so thoroughly fix certain characteristics that his corn will retain them under widely varying conditions. Two varieties grown quite commonly in Ohio illustrate this point, Reid's Yellow Dent and Leaming. If one is reasonably familiar with these varieties, either one may be recognized almost at sight when found growing anywhere in the state. We believe you will agree with us, after examining these exhibits, that a variety may in time become adapted to widely different conditions and still retain enough general characteristics to be recognizable though the type of kernel as to depth and dent will be changed very materially.

Leaming is by far the most widely distributed and best known of the two. We have reports showing that it has been grown in Clinton county, which is the home of its originator, fifty-three years; Fulton, forty-four years; Medina, twenty-three years; Morgan and Belmont, twenty-five years. In the northeastern and the extreme northwestern counties the opinion seems to prevail that Leaming is better adapted to their best soils. From Knox and Licking westward in the center of the state it is mentioned among many others as good, while in the best corn counties in the southwestern part of the state it is often named among the varieties as best for the thinner soil.

The corn show has exerted a powerful influence all over the western half of the State. Largely due to its influence many men are trying to grow Reid's Yellow Dent because it has been successful so often in competition for prizes. Of all the reports sent in none show that this variety has been grown in the locality more than six years, which is about as long as corn shows have flourished. The grain dealers in the west half of the State report that the percent of this variety is increasing. Sixty percent of these dealers in the best corn territory think it desirable, while the remainder do not or are undecided. We hope to see Reid's Yellow Dent and Leaming put into every variety test in the western half of Ohio in 1910. "Handsome is as handsome does."

We feel inclined to say just a word about White Cap corn. Dividing the State roughly into two sections, north and south, we find that seventy-six percent of the reports from the northern half mention White Cap as best or one of the best for thin land, while the south half mentions it in but sixteen percent of the reports. If we consider the northeast corner of the State alone, where the poorest corn land is located it is mentioned in eighty-nine percent of the reports. We also learn that the farmers are proving their faith by their works, for northern Ohio grows fifteen percent, southern Ohio five percent, while the northeast section has twenty percent of White Cap.

Gentlemen, granting that these estimates are reasonably correct, what does it mean? Is it due to the fact that White Cap corn is a cross of yellow and white; is it due to the white color being better adapted to thin soil, or is it all imagination? We offer it as a quid for your reflection for the next twelve months. Meanwhile, let us put White Cap into every variety test in northern Ohio and find out where we stand. If this popular opinion is merely a myth, let us prove it. If it is true let us recognize it, or else stop quoting our motto "The most pounds of marketable shelled corn per acre."

As it appears to your Committee the selection of the best variety for each type of soil in every community of the State offers to the corn growers of Ohio a problem second to none in importance. We believe we speak advisedly when we say "Offers to the corn growers in Ohio," for like eternal happiness for the individual, every community must work out its own salvation. No man or committee can arbitrarily settle the question at long range. The Experiment Station with its staff of scientific investigators, will work out the principles involved; but when we come to the selection of varieties we need at least one Experiment Station in each township.

We believe the local corn improvement associations are peculiarly adapted for taking up this work. The large plot test, such as has been conducted by the county associations, makes a little too large a draft on time to be carried on by the average farmer alone. He needs an organization behind him to give him confidence and some help at critical times. Assured of this, no careful farmer need fear to undertake such a variety test.

There are a few points which the experience of the past has demonstrated to be essential for a successful test.

First, a uniform piece of ground on which to conduct the test. If there must be any inequalities, let them extend across the plots so as to affect *all* equally.

Second, Have all the seed carefully tested for germination in order to secure a uniform stand, without which no satisfactory comparison of varieties may be made. A proper adjustment of the planter will also assist in obtaining this result.

Third, Plant an occasional plot with the same variety to serve as a check on any inequality of the soil. In one county test in the past season, the check plots yielded as follows: 68.01, 61.96, 60.45, 77.08, 109.57 and 77.08 bushels per acre. Had there been no check variety, no fair comparison of varieties could have been made, and the whole season's work would have been of little value.

Fourth, Thin the corn at the proper time to a uniform stand. In a thick and thin test in one county, in 1909 where one plot had a stand of three plants per hill and the one adjacent three and one-half per hill, there was a difference in yield of 8.01 bushels per acre. In another case a difference in stand of one stalk per hill made a difference in yield of 7.2 bushels per acre.

Fifth, Provide for a shrinkage and shelling test by saving a sample from each plot. Immature corn will shrink much more than mature. Varieties also vary in percent of shelled corn. In one such test in the past season one variety shelled fifty-seven pounds and another fifty-nine and one-half pounds per seventy pounds of ear corn.

Sixth, Do not undertake to test too many varieties the first season, and let most of these be the more promising in the community.

The Experiment Station will furnish a list of other varieties giving the name and residence of the grower from which the associations may select those which they wish to try beside their local varieties. Doubtless, as in the past the Station will also be able, where it is desired, to send a representative to assist in making plans and working out the details of the test.

The county association tests of 1909 have shown that the average yield of the poorest two varieties in each test was 30.2 percent less than the average yield of the best two in each test.

Gentlemen, we cannot afford to grow a variety yielding fifty bushels per acre when we might grow one that under the same conditions would yield sixty to seventy. Judging from the reports from three hundred and ninety corn growers in the state, 85 percent *think* they are growing the variety best adapted to their locality, or if not the best, as good as any. Probably most of them "are from Missouri and must be shown."

The time is not far distant when we hope to see a variety test conducted by a corn improvement association in a large number of the townships in Ohio. In 1909 fourteen counties, viz., Butler, Warren, Fairfield, Logan, Mercer, VanWert, Putnam, Hardin, Huron, Lake, Columbiana, Belmont, Meigs and Franklin, conducted from one to a half dozen or more such tests each. Is it too much to expect one in each association in the state in 1910?

Gail T. Abbott. Chairman.

The conclusion of the county corn variety test

The National Stockman and Farmer Trophy Cup

REPORT OF THE COMMITTEE ON UTILIZATION

G. E. Jobe, Cedarville

Reid Carpenter, Mansfield
Jno. P. Langdon, Sabina
Frank Balyeat, Van Wert
E. C. Darling, Nellie
F. I. Heim, Wooster
Dillwyn Stratton, Winona

It may not be possible for farmers to utilize all their farm crops upon the farms. We think, however, if more farmers would feed and use more of their crops on their farms, they would in a large measure enrich their land and improve the material wealth of our country. Your committee has made an effort to gather data from all sources that was possible, especially from persons who have kept account of their work, and who know the reports they have given us are accurate. We have not been able to get together as much information as we wished. We were anxious to have reports from all lines of live stock production, but we think the trend of the work as we have it from the farmers of Ohio is indicative of more systematic and scientific methods of feeding and keeping accounts of their results. We have not the least doubt but that there are hundreds of farmers who are obtaining as good results as these men from whom we have heard. A large number of them have not the means or equipment to weigh their stock and feed at regular or stated periods as our informants, while we also know that numbers of farmers who have all the necessary arrangements are not using them for their personal knowledge, and at the end of the feeding season they do not know what their balance sheet would show.

In this report your committee will endeavor to show the necessity of utilizing the corn crop upon the farm from two standpoints First, the value as food for livestock. Second, the value as a fertilizer, after being fed to the livestock. Our report is the result of our correspondence, and due credit should be given to the persons who have so kindly given their results to the committee. You will observe that these feeding operations have not been the results of exclusive corn rations, they have had a variety of different kinds of feed, and in some instances the feeder has given credit to the feeds used, otherwise you can make your own deductions.

Oliver Garlough, Cedarville, bought 280 bushels of corn August 1, 1873. August 14th turned 20 hogs, average weight 169 pounds, on an 8-acre clover field, were fed until November 1st, sold at that time, average weight, 375 pounds, hogs 18 months old, no corn fed through the summer, but had the run of good clover pasture, made the gain of 14 2-3 pounds per bushel of corn. Also this report, 17 pigs weighed 2073 pounds, July 18, 1907 were fed 85 bushels of corn

on 8 acres of second growth clover, sold August 28th, weighed 3705 pounds, gain 1632 pounds, at 6 1.2 cents per pound, made $1.24 for each bushel of corn fed, for which I think the clover was worth at least 24 cents for each bushel of corn.

Dobbins Bros., Cedarville, April 5, 1908, 60 head fall pigs weighed 7320 pounds, May 17th, same pigs 11075 pounds, gain 3755 pounds at 7 cents per pound, $262.85, corn consumed 210 bushels, making the corn worth on the farm $1.25, these hogs were fed dry tankage once or twice a day in troughs, and think we used about $10.00 worth of this feed during this feeding period, we feel sure that we received several times this value in manure. Also this report, June 8, 1908, 22 head fall pigs weighed 3040 pounds, July same weighed 3620 pounds, corn fed, 38 bushels, gain 580 pounds at 7 cents, amount received, $40.60. Also this report of turning hogs into the corn field fall 1909, 100 spring pigs which had been full fed on new corn for two weeks, turned into 1 1-3 acre of corn, with a run of short grass, put on a gain of 900 pounds at 8 cents, the market price at that time, making $72.00, or $54.00 per acre.

W. W. Hyslop, Springfield, for the years of 1907 and 1908, put 17 acres of corn in silos, fed to 50 head of steers, which weighed November 7, 39050 pounds. Were fed all the silage they would eat and one pound of oil meal per steer per day, and all the rough feed they would clean up until March 1st, at this date they weighed 47050 pounds, a gain of 8000 pounds. From this time we fed sliced corn until April 1st, the silage being all used at this date. We fed corn in three ways, sliced, shelled and ground. On May 5th they were weighed and made a gain since March 1st, of 4800 pounds, having consumed 600 bushels of corn. Cost of cattle $1562.00, cost of corn and oil meal $517.00, amount received for cattle when sold, $3,111.00, total cost of cattle and corn $2079.00, which leaves $1032.00 for 17 acres of corn put through the silo, a value of $60.00 per acre. We consider the manure and hog feed good pay for the rough feed. For the years of 1908 and 1909 we fed the same number of steers in the same way we did the year before, but this year it took 22 acres of corn to fill the same silos, and reduced the profit to $48.10 per acre.

We have some other reports of silo feeding, but the men did not have it in such a way that they could give any definite accounts. As to the value of the corn as a fertilizer when fed and used upon the farm, we wish to give you the report as submitted by Director Thorne of the Ohio Experiment Station.

Wooster, Ohio, December 6, 1909.

Mr. G. E. Jobe,
Cedarville, Ohio.

My Dear Sir:—In further reply to yours of November 19th, I would say that the analyses made by this Station on Ohio crops indicate that corn contains the following percentages of fertilizing constituents:

	Percentage composition		
	Nitrogen	Phos. acid	Potash
Grain	1.76	0.54	0.41
Cobs	0.50	0.06	0.77
Stover	0.81	0.15	0.94

It requires about 50 pounds of stover to carry a bushel of corn. At this rate a 50-bushel crop of corn would carry the following total weights of the various constituents per acre:

	Nitrogen	Phos. acid	Potash
2800 pounds grain	39.3	15.1	11.5
700 pounds cobs	3.5	0.4	5.4
2800 pounds stover	20.2	3.7	22.5
Total	63.0	19.2	39.4

When we buy these materials in the fertilizer sack we pay about 20 cents per pound for nitrogen and 6 cents per pound for phosphoric acid and potash. At these prices the constituents of a 50-bushel corn crop would cost as below:

	Cost of constituents			
	Nitrogen	Phos. acid	Potash	Total
2800 pounds grain	$7.86	$0.90	$0.69	$9.45
700 pounds cobs	.70	.02	.33	1.05
2500 pounds stover	4.04	.22	1.35	5.61
Total	12.60	1.14	2.37	16.11

If we should get our nitrogen free by growing clover we would have to buy only phosphoric acid and potash, but our experiments indicate that we cannot expect to get all the nitrogen needed through clover, unless we plow under the whole crop, which few of us have the nerve to do.

Where this Station has begun on good land, cleared from the forest by ourselves and carefully managed, we have been able to hold up the yields by growing clover one year in three and taking off the hay crop; but on land that had been run down by previous hard cropping the yield is diminishing in a 3-year rotation of corn, wheat and clover, all the crops being taken off the land and nothing returned.

Even if we were to feed all the crops and return all the manure made there would be some loss, because the animals would put a considerable part of the phosphorus into their bones and nerve tissues. Thus we find that we get the following returns, in a rotation of corn, wheat and clover on poor land:

	12-year average yield per acre		
	Corn	Wheat	Clover
	Bus.	Bus.	Lbs.
No manure nor fertilizer	27.6	11.4	2,328
Untreated, open yard manure	51.2	19.8	2,927
Untreated, fresh manure	57,1	21.3	3,587
Phosphated, fresh manure	64.4	26.8	4,687

Thus showing that on an exhausted soil something beside manure is needed. On good land, where phosphorus and potassium are supplied liberally it does not seem to be necessary to add much nitrogen, if clover is grown every third season; but on exhausted soils the case seems to be different. Thus at Germantown, in a 3-year rotation of corn, wheat and clover, we get the following results:

	Average yield per acre		
	Corn Bus.	Wheat Bus.	Clover Lbs.
No fertilizer	45.84	9.43	2,344
Phosphorus alone	50.20	13.23	2,774
Phosphorus and potassium	57.83	15.64	2,968
Phosphorus, potassium and nitrogen	59.88	17.05	2,842

The phosphorus and potassium seem to be all that the clover needs, but the cereals want some nitrogen in addition to that which the clover provides for them.

All our work, therefore, shows that on all except the most fertile soils the full capacity of the crop is only attained by the use of fertilizers containing nitrogen, as well as phosphorus and potassium; but as shown in the first table, nitrogen is by far the costliest of the contents of the fertilizer sack. What, therefore, can we substitute for fertilizer nitrogen? This Station's work answers the question:

Fertilizing materials	Annual cost per acre	Annual value of increase Total	Net
Acid phosphate	$0.52	$3.29	$2.77
Acid phosphate and muriate of potash	1.82	4.72	2.90
Acid phos., mur. of pot., and nit. of soda	4.70	7.90	3.20
Acid phos. and barnyard manure	7.82	13.60	5.78

In the last statement the constituents of manure are rated at the same price they would have cost in the fertilizer sack, thus allowing $2.60 as the value of each ton of manure, as compared with commercial fertilizers. You will see that on this basis the manure is giving a larger profit than the fertilizers.

I am not sure that I have quite answered the question you have in mind, but the above is, I think, a fair statement of the question as between manure and fertilizers, except that it should be understood that these results are only attained under systematic and continuous work. On first application fertilizers almost invariably produce a larger effect than manure, and we only get the above results from manure when it is reenforced with phosphorus.

Yours truly,

Chas. E. Thorne.

Director.

Comment on these reports submitted by these gentlemen is not in the province of your committee, it is perfectly evident that a systematic plan of feeding our crop of corn upon the farm is the best method of disposing of the King of all crops, the Corn.

G. E. Jobe, Chairman.

The Patrons of Husbandry Trophy Cup

REPORT OF COMMITTEE ON MARKETING CORN

H. W. Robinson, Greenspring

E. A. Peters, Groveport
W. J. Mathews, McGuffey
O. H. Fawcett, Bellefontaine
O. O. Zehring, Germantown
W. A. Starbuck, Wilmington
Elmer Jameson, Haviland

The year 1909 has not been an exceptional one, yet it has been a most interesting one for the study of marketing corn. The 1908 crop in Ohio was good in quality and quantity. Owing to the excellent maturity, dealers and farmers did not experience much trouble and loss in handling it during the months of January, February and March, even though we had an open winter. After April 1, 1909, the crop was handled with unusual safety and with bounteous returns to the grower.

A very different condition confronted us when the new crop of 1909 commenced to move. Corn generally seemed to be matured until husking commenced when it was found, especially in the central and northern part of the state, to be the contrary. An unfavorable season was largely responsible, yet we must contribute a small percent of the cause at least, to farmers attempting to grow the larger and necessarily later varieties, in order to decidedly increase the yield, and this, in spite of the warning of our Agricultural College and Experiment Station against such an attempt. Even after the corn was husked the eye was deceived and the moisture test was necessary to reveal the true condition. Because of this, many dealers experienced serious trouble and severe losses during November and December, even though paying from three to five cents per bushel below the usual margin for handling, which gave rise to dissatisfaction on the part of many growers.

Scientific investigation and application has brought about marked changes in the corn trade during the last few years. This together with the general prosperity of the country and intellectual advancement of the American farmer, has introduced new methods in the handling of this cereal more than any other. Not many years back, farmers in the corn growing sections who were able to carry their corn did so in poorly constructed cribs in many instances, built from fence rails and with trifling, if any, covering. However, the bulk of the corn grown for market was delivered and sold during the harvesting season to the local merchants. This made it necessary for the country dealer to have large crib capacity. He not only had to have this in order to take care of the growers crop but the consumer looked to him to carry the corn to supply him throughout the year. Under these conditions the farmer was unable to realize as much in comparison to the prevailing price as under the present system because the dealer not only had to take the chance of loss in

curing from heating in store but the chance of a decline in market. But now it is very different and the average country dealer rather assumes the role of commission merchant than a speculator. These bright years of the first decade of the twentieth century in American progress and prosperity have proven to be most kind to our worthy farmers. No other vocation could have been blessed with more bounteous results to modern society. From a slavish barter he has become not only an intelligent farmer but an intelligent business man as well. I would ask you to bear with me in diverting with these thoughts. I do so beause it seems permissable in view of the position the farmer takes relative to the subject before this Convention.

Then I would say with these changed conditions, the corn grower is not only realizing more from this crop by assuming the risk of curing, which he is able to do with much more safety than the dealer but also stimulating a healthy market condition throughout the year instead of crushing the market just at the time he is selling only to induce a scarcity duridg the summer months.

Another important factor that has entered into this new system is the innovation of corn dryers. Great preparation has been made during the past year or two for kiln drying corn not only in the large terminal corn markets but at many country points where corn is marketed extensively. The work is inexpensive compared to the risk arising from heating. The cost of drying varies, of course, according to the amount of excess moisture in the corn and this expense added to the loss in weight during the process is simply a matter of computation and the progressive farmer is as justly entitled to know and be as familiar with it as the dealer in order to determine a true value of this product at any season.

In this connection I would direct your attention to information for which your commitiee is indebted to Mr. Culver, Chief Grain Inspector, Toledo, Ohio. As a basis the Inspector gives us 555 cars handled in that market in November, 1909. Of these, 23 inspected No. 2, all having been kiln dried, the moisture having been reduced to 15 percent; 203 cars inspected No. 3, the average moisture being 17.4 percent, the most of it having been dried since originating in the corn belt of northwestern Ohio, where a number of driers have been installed at country points; 295 cars inspected No. 4, average test, 20.7 percent. and 34 cars grading sample, the average test being 22.2 percent. All things considered, this may be deemed a fair average of the 1909 crop in Ohio, however, to substantiate it, I submit the report kindly given me by the Seeds, Grain & Hay Co., of Columbus, showing the condition of corn handled by them in November and December, 1909:

"Up to November 9th, the average moisture was 22 percent. During the next ten days, the average test of 18 cars was 20.6 percent and only one graded No. 3, showing a test of 19 percent. Out of the 18 cars handled during the last ten days of November, 10 graded No. 3, moisture ranging from 17.2 to 21 percent. During December, out of 28 cars, 16 graded No. 3, the moisture range being from 16.8 to 21.2 percent with an average of about 19 percent."

Thus we find the moisture test not only indispensible to the dealers in fixing a true value, but it should be of equal value to the grower for the same reasons. The matter of storing market corn means the construction of proper curing cribs without losing sight of saving and protection. In considering this, I would direct attention to a contribution published in the last issue of the Ohio Farmer, by Mr. Tweed:

"Dealing in future corn is a subject of greater importance to the producer than is generally realized. The Board of Trade is looked upon by many with suspicion and in the minds of some the practice is questionable. Like so many other kinds of business under our industrial systems its abuse is possible. We must look to legislation to regulate the danger that may arise from these transactions such as the possibility of running corners. I will not attempt to discuss this but have introduced it in connection with this subject because under the modern methods of handling corn many growers who choose to sell at a prevailing price can make a high rate of interest by selling for delivery in the future. It is not my purpose to commend this practice because of its possibility of giving rise to unsatisfactory trading between the farmer and country dealer. On the other hand, I do not condemn it because many farmers have derived benefit from it. Again it stimulates a healthy market condition. Then be not too hasty in criticising the trading in future corn or grain but hurry forth with some antidote for the poisonous abuses that have been instilled into the system. Before leaving this subject of holding corn whether for future sale or delivery, I refer you to the Cobwin Report from the Kansas State Board of Agriculture and Circular No. 43, Bureau of Plant Industry, U. S. Department of Agriculture, both of which may be studied with profit and interest.

Another important and oftimes disturbing influence on the market is crop reports. Last month the Government Report came out with an estimate of 151,000,000 bushels of corn whereas the State Board of Agriculture estimated the crop at 121,000,000 bushels for Ohio, a slight difference of 30,000,000 bushels. The difference gave rise to ridicule and criticism. Some who were interested contented

themselves by striking the happy medium but careful students of the crop thought the state figures even too high and from the steady upward move of the market since it would seem the public in general has accepted their opinions in preference to Government and State figures. But where the mistake? Don't be too quick in blaming the departments for they are supplied with the best human and mechanical adders that can be had, and they employ competent crop experts who travel for the purpose of gaining correct information. Then we can but lay the mistake to the hundreds and thousands throughout the country who send in the local reports to be compiled and as I understand it, most of these are made by farmers. If any within my hearing are members of this order of crop reporters, I would suggest that you call a meeting of the brethern for the purpose of asking forgiveness because of the injury you do to your own business. I feel sure that 75 percent of the reports farmers have been sending in are too high, and the producer suffers because of it. More accurate plans must be devised if we would have more reliable reports.

One member of the Committee insists we urge the feeding of corn on the farm, therefore, I make mention of this, however, we must not lose sight of the fact that other needs for this commodity must be supplied. Over 150 different products are manufactured from corn, besides the many uses of the stalk. The demand for feeding in cities and in localities where little if any is produced will continue to be a necessity regardless of price. No product of the farm has a brighter future, from the standpoint of profit for the grower. The days of cheap corn have passed on and it is gradually moving to a higher level where it justly belongs, when food value is considered, in comparison to other grain.

H. W. Robinson, Chairman.

REPORT OF COMMITTEE ON EDUCATIONAL TRAINS

H. C. Price, O. S. U., Columbus
H. W. Robinson, Greenspring — W. K. Orr, Chillicothe
John Cunningham, Gambier — Austin Herrick, Twinsburg

Your Committee on Agricultural Trains has only a brief report to submit.

Since the last meeting of this Association, trains have been operated on four different railroads:

On March 23-27, inclusive, 1909, a train was operated on the C. H. & D. (Cincinnati, Hamilton, & Dayton) Railroad in the western part of the state. In the five days, forty-one stops were made and nearly five thousand people addressed. Over three hundred miles were covered. The lectures on this train were on corn, soil fertility, and live stock.

On April 2-3, inclusive, 1909, a train was operated over the T. & O. C. (Toledo & Ohio Central) Railroad from Columbus to Middleport and returned over the Hocking Valley via Gallipolis to Columbus. The lectures on this train were on fruit growing and forestry.

On December 1-2, inclusive, 1909, a trip was made over the O. R. & W. (Ohio River & Western) Railroad from Zanesville to Bellaire. The lectures on this train were on fruit growing and dairying.

Trains have been arranged for the latter part of this month over the B. & O., B. & O. S-W., and the N. & W. railroads covering their lines in the southern and south-eastern part of the state. The trip will occupy nine days and about five hundred miles will be covered. The lectures will be given primarily on fruit growing and dairying.

Negotiations are under way with the Nickel Plate, the Wabash, and the Wheeling & Lake Erie Railroads for trains this spring.

The result of the work has been to stimulate an interest in agriculture through the sections in which the trains have been operated. In the corn sections, especially, the trains have shown results. The railroads are enthusiastic over their success and, as a rule, are glad to furnish equipment for these trains. From the experience in the past, it is generally agreed that it is necessary to make the stops at the different stations longer than was first made by the trains that were run. Now it seems desirable to stop for not less than one hour and as much longer as can be arranged.

One recommendation that your Committee has to suggest is that this Association recommend to the Legislature that the present railroad legislation be so modified as to make special provision for

the operating of special trains. The question has arisen several times in reference to this matter and the State Railway Commission has ruled favorably upon it. However, it would remove any question if special provision were made.

Respectfully submitted,

H. C. Price, Chairman.

The Farm Management Trophy Cup

REPORT OF COMMITTEE ON PUBLIC SCHOOL WORK

A. B. Graham, O. S. U., Columbus
H. D. Bowsher, Wapakoneta
S. W. Harvey, Fleming
L. S. Ivins, Lebanon
C. H. Allen, Paulding
Victor Herron, Chandlersville
C. S. French, Salem

Industrial instruction based on a text book alone is much like a man standing on one foot, fearing that if he put the other foot to the ground he might walk away. So it is with the teaching of Agriculture in some places. Theory alone can never take the place of deductions that must come from experiments and tests.

Corn growing and corn improvement being the two particular subjects that fall within the province of this organization, the committee has much less in results than in efforts to secure them, to report.

It has been considered best to require a corn record of those entering the Boys' Individual contest, and a record and written production on "How to Improve the Corn Crop" from those entering the High School contest.

After more than five hundred blank corn records were sent to boys and girls upon request of teachers, not one dozen are found at present in the State Display. More than two hundred newspapers were communicated with in regard to these contests and during the month of November, 1909, more than ten thousand folders showing the trophy cups and giving the rules for the County and State Contests were sent to teachers and children. The Agricultural Extension Department of the College of Agriculture has cared for the financial part of the publicity feature of this work.

The change of teachers in both high and district schools breaks much of the interest in either county or state contests. Lack of interest in the young peoples' feature of local contests has not given much encouragement to the state contest. It is hoped that during next year's work the young people will be encouraged to enter the local contests with a view to entering the State Contest. It is to be admitted that the local corn shows are the very important ones; there should be an opportunity such as is found in the State Corn Show to measure up with the best in the State. County Fair Boards should make a place for the young people to display corn of their own production.

Most of the adult exhibitors are in attendance at this show but the teachers and young people who are interested in the contest are, because of duties in the schoolroom, denied the privilege of attending the show.

This committee recommends that more prominence be given to local agricultural exhibits by the boys and that, to secure more continuous work in Agriculture in the public schools and to bring about a greater degree of preparation by the teacher of Agriculture, a law be passed requiring teachers to be examined in Agriculture, provided they are required to teach it as a part of the school course.

Respectfully submitted,

A. B. Graham, Chairman.

As much a part of his education as the "Three R's."

REPORT OF COMMITTEE ON ROTATIONS AND FERTILIZERS

Alfred Vivian, O. S. U., Columbus
N. C. Frost, West Mentor
C. O. Snyder, Millersburg
J. S. Brigham, Bowling Green
Isaac Sollars, Washington C. H.
Jno. I. Wentz, Bucyrus
Chas. Bone, Utica

The Committee inherited from the similar committee of last year a legacy in the shape of instructions and recommendations for this year's work. The report of the last committee recommended that this Committee devote its time to the collecting of all possible statistics regarding the rotations and fertilizers now in use in the state of Ohio. The information thus desired, it was hoped would prove of value to succeeding committees by indicating lines of research which might eventually lead to suggestions which would prove of value to the corn growers of this and other states.

The Committee has devoted its work for the past year to the collection of the above mentioned statistical data. As the Committee had no funds at its disposal, its labors were necessarily confined to such work as could be done through correspondence. Having had some experience in attempting to collect data by mail, we decided to ask only a few questions in the hope that the brevity of the blank might induce some to reply who would be "scared out" by too long a list of questions.

We, therefore, prepared a blank containing the following six questions:

1. What is the rotation usually followed on your farm?
2. On what crop or crops in this rotation do you use stable manure?
3. Do you use any commercial fertilizer; if so, what kinds and on what crops?
4. Do you grow any crops to plow under as green manure? If so, what ones and under what conditions?
5. What style of farming do you practice?
6. What rotations are generally followed in your community?

This blank was attached to a letter stating the purpose of the same and asking the cooperation of the members of the Association. Several hundred such blanks were sent out both to the secretaries of the county associations and to such other addresses as were available.

One hundred and twelve replies in all were received. These replies represented forty-one counties and were pretty well distributed over the state. From some counties, we received only a single reply while Lake County led the list with ten replies, Pickaway being second with nine, and Butler and Wood ranking third with seven each.

In analyzing these reports, we find that eighty-one practice a four or five-year rotation of corn, oats, wheat, hay (one or two years); twenty-seven use a three-year rotation of corn, wheat, and clover,-one used corn, oats, and clover; and two reported a two-year rotation of corn and wheat. In this last rotation, clover is planted with the wheat and allowed to make as much growth as it will before spring and then plowed for corn.

While all those sending in blanks report some kind of a rotation in use on their own farms, many of them speak of neighbors who grow corn continuously, a practice which one hopes is not very generally followed in the state. One man reported that some farmers in his locality grew corn "every year until they could not even get nubbins" and "then planted to grass until the soil would produce some corn again". We feel sorry that he called such men "farmers."

In reply to the second question, we find that one hundred and five report that they apply manure to the sod to be plowed for corn; five top-dress the clover with manure in such a way as to get the first returns from the manure in the hay crop, the residue of the manure and the increased growth of clover being used to fertilize the corn; thirty-one used part at least of the manure to top-dress wheat; nine used manure on potatoes; five on tobacco; and one on oats.

Twenty-one of those reporting use no commercial fertilizer of any kind. Most of these reports come from the north-western section of the state. Seventy-seven fertilize wheat; twenty-two are using some fertilizer on corn; eleven on potatoes; three on grass and tobacco; and three fertilize corn, oats, and wheat. Of those using fertilizers, twenty-seven used plain acid phosphate; twelve used bone meal; two, basic slag; four used potash alone; and twenty-seven used complete fertilizers. The complete fertilizers reported were nearly all low grade goods, the favorite combinations being this which approximate 2-10-2 or 1-8-4. Only three cases were reported of the use of complete fertilizers of much higher percentage of plant food than these. Three men reported that they were in the habit of buying the crude materials and mixing their fertilizers at home. One man reports the use of floats in the place of acid phosphate.

Last year's committee called special attention to the work reported by the Experiment Station in Bulletins 182 and 183, and recommended that every member of this Association make a special study of these bulletins with the idea of putting some of their teachings into practice. That committee endeavored to emphasize the very important results obtained at Wooster by the use of acid phosphate and floats with stable manure and suggested that it would be worth while for every farmer in the state to give this method a

trial. It was, therefore, with much interest that we scanned these reports to see if we could find any evidence that this suggestion had borne fruit. To our great disappointment, we found that only three of them reported the use of either floats or acid phosphate with manure.

In reply to the fourth question, we find that ten report plowing under clover for green-manure; thirteen plant rye as a catch crop in corn; and one reports using turnips in the same way. We find also that one hundred and six sow the clover and other grass seed with wheat; six sow with oats.

Of the number reporting, seventy-five are engaged in mixed farming; two in grain farming; twenty-seven in stock raising; seven in dairying; and one each in truck, tobacco, and potato growing. The dairy and truck farming are reported from the north-eastern section of the state. That section also reports the most varied and largest use of farm manures. As a rule, the farmers of this part of the state report the longest rotations and grow more potatoes, fruit, and hay. In some cases, hay is said to be grown for six or seven years continuously. Fertilizers are generally used and little grain is sold.

The north-western section of the state reports little use of fertilizers; more oats than wheat; and a considerable number of farms are devoted almost exclusively to grain producing, a small part only of the grain being fed on the farm. Corn seems to be the main crop and the rotation almost universally of three years.

The south-western section practices a three-year rotation of corn, wheat, and clover, with some tendency to grow corn after corn for some years, except in the tobacco sections. Judging from the reports, little manure is applied. Larger fields are mentioned than in any other part of the state, indicating larger farms. In the vicinity of Cincinnati, timothy is apparently grown to the detriment of other crops.

The south-eastern section reports more grazing and some fruit. Where general farming is practiced, longer rotations are mentioned than in the south-western section. Care of manure was mentioned more often in reports from this section than elsewhere.

It must be understood that the data herein given is based on the reports made to the set of questions sent out by this Committee and does not necessarily represent the personal opinions of any member of the Committee. Some sections of the state, of course, are better represented in these reports than others. This report is submitted as matter of information and this Committee turns the work over to the incoming Committee without recommendations for the work of the ensuing year.

Alfred Vivian, O. S. U., Chairman.

REPORT OF COMMITTEE ON LOCAL ASSOCIATIONS

C. S. French, Salem

W. E. Bradley, Kent
Wm. Sprenger, Washington, C. H.
P. B. Floyd, Steubenville
G. Roy Crumrine, Nova
W. R. Goddard, Amesville
H. M. Cowgill, Delaware

Your Committee On Local Associations will not make a lengthy report at this time. The Chairman was only appointed in September and since then has had a long seige of fever.

We however sent out a list of questions to each secretary of Local Associations in the State, and have received replies from about half of them. The object of these questions was to ascertain whether the associations were growing, what lines of experimental work is being done, corn shows held etc., and whether the association is a success or failure. We hoped from these replies to be able to detect in a measure the secret of the successful ones, and the cause and remedy for those who have failed to fully come up to their expectations.

While we have not and probably never can make any fixed rule by which every association will be a success, we think experimental work which will get a large number interested, and hard work on the part of the officers, inteligently directed, will solve the problem. Begin active preparations for next seasons work as soon as you get home from this meeting. And if the farmers show a lack of interest and you feel discouraged, get a good nights rest, then roll up your sleeves and pitch in with renewed enthusiasm and say I will make a success of the association. It is wonderful what one determined man in a community can do. And remember that while you want as many members as you can get that is not the most important thing to work for. An association of twenty five members who are doing some experimental work to aid in growing better corn is worth more to a community than an association of two hundred who are doing nothing.

Out of twenty eight replies, four report their associations a failure. Three out of the four have done no experimental work and are holding no corn shows this year. One report says, "When we launched our organization we had no trouble to get members, but as soon as they found they were not getting something from the organization they dropped out". Certainly, why should they stay in if they were getting nothing out of the association?

With a live executive committee who would appoint judicious sub committees to carry on experimental work and corn shows, it should not be difficult to convince the members that they were getting something out of the association in the way of improved

varieties and methods. Make your organization both progressive and aggressive in the interest of the farmer and broad enough to cover not only the corn field but other phases of rural improvement as well.

We find a number of the associations are holding institutes in connection with their corn shows. One report speaks of experimenting with wheat. Another gives as a reason for their success, that they "include for discussion all topics of general interest to the farmer. Thus widening their scope so they do not have fried mush for breakfast corn bread for dinner and mush and milk for supper, seven days in the week.

The subject of holding the members in the association and collecting their annual dues seems to be one on which the secretaries have given very little thought. In answer to the question as to what plan they have adopted for collecting dues, the most of them answer something like this, "We expect them to pay and if they dont we will drop them from membership." Three or four say, "By personal and written appeals for renewals." And one secretary, who we believe has solved the problem says, "We expect to keep asking them to pay." We are satisfied that personal appeals will be the most productive of results. If however the membership is much scattered and the secretary cannot personally see all the members, he might appoint a man in each section to do the collecting for him. Or if it is necessary to appeal by letter enclose a coin card and return stamped envelope. Make it as easy as possible for the member to pay, and ask the member to notify the secretary if he does not wish to continue a member.

In this connection we would say that where the county is large it would be much better to form two or more associations, and in this way the officers can keep in closer touch with the members.

In conclusion we want to impress on the officers that the price of success is constant hard work. Dont expect too much of the members; the majority of them will think that when they have paid their dues they have done their whole duty. It will rest with the officers to do the work.

C. S. French, Chairman

REPORT OF COMMITTEE ON IMPROVING CORN VARIETIES

I. S. Cook, Jr., Chillicothe
Jas. W. Cook, Forest
Phillip Baer, Jr., Canal Dover
P. D. Leaming, Wilmington
Clem McKee, Eldorado
F. C. Snyder, Fremont
Frank Oliver, Versailles

The thought which comes to most farmers when they hear one speaking of improving a variety of corn is that of producing a variety that will do to enter a show room where large ears uniform in shape and color and certain other features are the points of value in determining the winner. This kind of ears can be produced and has been produced by a great many corn growers, by selecting ears of a uniform shape and color and planting them thin enough to enable the stalk to grow large ears.

The members of this Committee agree that the first point to consider in beginning the improvement of a variety is that of yield. No matter how uniform the ears of a variety may be in shape, color, indentation, length and circumference, if it will not yield as much per acre as a variety which does not have these show essentials, we consider the latter to be the most valuable to the farmer. What we need is a variety that will give as high a yield as we can get and yet show some uniformity of ears. Yield stands first in points of improvement, and along with it stiffness of stalks and the right placement of the ear on the stalk, while beauty follows as a secondary consideration.

In taking up the matter of yield we will consider some ways of increasing it. We have found the ear-to-row test to be the best method of improving a variety. Before taking up the ear-to-row test, however, it is usually best to conduct a variety test and find out the variety which without improvement gives the highest yield on your farm for three consecutive years.

When one has determined the variety which is best adapted to his locality for the production of dry corn, then he should work to find the plants of same which will yield the highest. We do not want to waste too much time in testing out a large number of ears in the ear-to-row test method, knowing nothing regarding the conditions under which they were grown. A method which the chairman of this Committee has followed and which he finds others also have used, is to plant an area of land very thickly, as many as six kernels in a hill. Now according to the law of the survival of the fittest a great many stalks will be so weak that they are unable to produce an ear, while a few stalks are so strong and vigorous that they are able to produce a fair-sized ear. By taking seed ears from stalks which have been grown in hills containing four or five other stalks we are quite sure of finding the most vigorous seed ears.

The chairman of this Committee has found an increase of six bushels per acre grown from seed selected in this way in comparison with seed selected after harvest. We do not recommend continuing thick planting of these seed ears which have been selected in this way, but we do believe this method is very valuable to us for obtaining seed with which to start.

If we want to work toward uniformity the seed ears which have been selected from thickly planted hills should be worked over in order to select the ears that are more or less uniform, before putting them in the test. One should not think that on account of the ears being uniform in shape and color and other characteristics they will yield practically the same; this is far from being true as we have discovered in our ear-to-row test work. By having uniformity of the ears that we put in the ear-to.row test we will be improving that feature which we like to have along with yield.

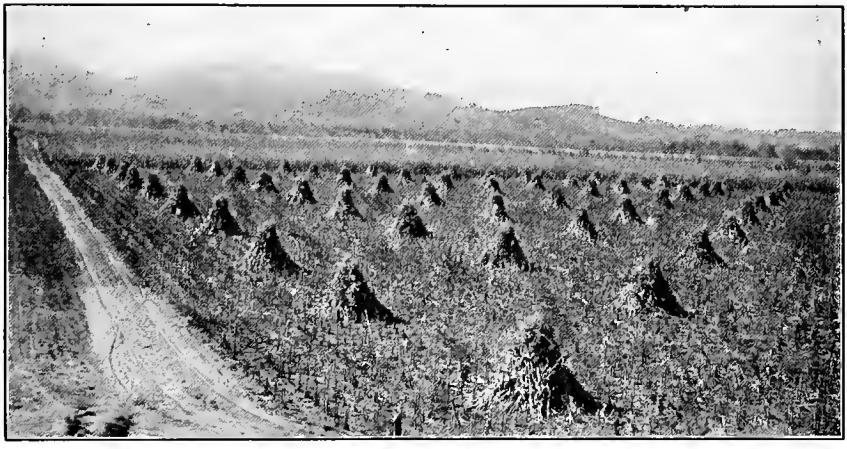
We should give special attention to that very desirable feature, uniformity of size and shape of kernel. Select seed ears that have just a medium depth of kernel and that are not what would be called rough ears. We are finding the smoother ear yielding the highest. See that the kernels have good thickness, as that seems to be a good characteristic. All corn growers recognize that a good stand has a very important bearing on the yield, and to get it, a planter must have uniform kernels before it can do the best work. Corn graders may help us to overcome this fault of a variety, but selection to obtain uniformity of kernels is the basis of getting a good stand, taking it for granted that every farmer tests his seed for germination.

We find a great many corn growers who, not being satisfied with the variety they now have, are sending to some other county and many times to some other state for seed corn. Farmers are losing money when they do this, for they know nothing of the yielding qualities of this seed corn and nine times out of ten it will not do as well as their own corn. The writer of this report conducted variety tests the past year in which he used corn from several different states. In only one case did corn obtained from another state mature as well as the local varieties. It came from northern Illinois. Corn grown fifty miles south of us will not in general mature well the first year.

Finally, we advise farmers to test out the local varieties and having decided which is best, to set to work to improve it in yield by selecting seed ears from the stalk in the field, as previously described, and then to test out these selected ears in the ear-to-row test. Some corn growers may think they have not the time to

devote to this careful work of improving their variety, but if they will do it two or three times they will be convinced that nothing will pay them more for their time. If corn growers will not take up this method of improvement they should at least practice the selection of seed corn in the field, when they can note conditions under which the ears were produced.

I. S. Cook, Jr., Chairman.



Portion of a southern Ohio farm where careful systematic seed selection and preservation is practiced and where 700 acres annually yield about 75 bushels of corn per acre

THE IMPROVEMENT OF FARM CROPS IN ITS RELATION TO THE FERTILITY OF THE SOIL

By DR. LOUIE H. SMITH, University of Illinois

We have been hearing a great deal lately about the matter of the conservation of our natural resources, and as a people we are just becoming aroused to the seriousness of the demand which will soon be upon us for increased production.

In the light of the present rate of increase in population the prediction now being made does not appear unreasonable that in the year 1950 there will be in this country 200,000,000 souls, with as many bodies to be fed and clothed. When we consider in this connection the fact taught by statistics that along with every individual human being there are on the average two and one-half head of domestic animals, horses, cattle, sheep and hogs, to be maintained, the tremendousness of this demand upon the soil for increased production is almost overwhelming.

LANDS WEARING OUT

The situation becomes the more complicated because coupled with this necessity for increased production in the immediate future . . is the problem of soil ruination—a problem which is already upon us. I need not cite you to those old agricultural countries such as India, China and Russia, famine stricken struggling against poverty and want, for examples of soil depletion. Already in the older sections of our own country land has become so impoverished that farms which were at one time among the most productive have become so poor that the owners have abandoned them rather than pay the taxes.

Although there still remain some large areas of land to be developed by irrigation or otherwise, they are already limited so that this resource; namely, the acquisition of new land upon which we have relied in the past, offers now at best only a temporary solution.

And so this whole problem of the improvement of our agricultural crops is not one of the distant future in which it is our duty to do a little forewarning, but it is a problem already upon us in all its seriousness, and the vital question before us is how to make each acre now under cultivation more productive.

FACTORS INVOLVED IN CROP IMPROVEMENT

There are of course a great many factors involved in the growing of crops, but for the purposes of investigation and discussion the controllable factors many be considered under three headings; namely, feeding, breeding, care.

And so there are three principal ways of increasing production, and these are by the improvement of the soil, by the improvement of the plant, and by better methods of cultivation. In other words, *good feeding*, *good breeding*, and *good care* are *just as essential for corn and wheat as for cattle and hogs*.

It is scarcely profitable or possible to compare the relative merits of these three factors in the upbuilding of our agriculture. All are essential and for the highest success in farm practice, they must go hand in hand. Recognizing therefore the importance of each of these means of improvement, let us consider briefly today the first mentioned; namely, feeding of the plant. It is my privilege to touch upon that other phase of the question, the improvement of crops by breeding, at the coming meeting of the Ohio Plant Breeders' Association, so today I shall endeavor to steer clear of my own particular hobby and confine this discussion to the relations between crop improvement and the fertility of the soil.

PROPOSITIONS ADVANCED FOR SOIL MAINTENANCE

Recognizing the situation with regard to this soil problem there are being offered through the press and elsewhere numerous suggestions and solutions some of which are apparently very simple in their nature. Among these remedies proposed may be mentioned the following: 1, Smaller farms; 2, Thorough tillage; 3, Better seed; 4, Crop rotation; 5, Livestock husbandry.

FACTS AND FANCIES

It seems as though it would be worth while on this occasion to consider briefly a few of these proposals in the light of some of the considerable scientific knowledge that now exists. And why not apply science to agriculture? Nearly every other industry is now based upon science. Neither theory nor experience has been found to be adequate without the aid of science in other industries, neither are they adequate in that basis of all industries, agriculture. Yet there are here and there farmers who seem to shy at that word *science*, doubtless because it is misunderstood. Last week I ran across a new definition for this rather abused word which I think is good enough to pass along. It runs thus: "Science is not a preserve for intellectual sportsmen, but nearly organized common sense."—*Organized common sense!*

In Germany the average yield of wheat is 28 bushels per acre, in the United States it is 14 bushels. In Germany they do not hesitate to accept and to apply known scientific facts relating to agriculture as well as to other industries. In the United States we pursue our haphazard methods and often boast that we "do not take any stock in this book farming."

In dealing with questions of the soil we have to do with such a complicated set of processes when we consider all of the chemical, physical and biological activities, that it is difficult to comprehend at once all of the intricacies involved and thereby it is very easy to become misled.

Probably the most common and at the same time most serious error made in this connection is in overlooking that most fundamental fact; namely that *plants are not made out of nothing.*

PLANTS NOT MADE OUT OF NOTHING

Science tells us that there are ten different elements which enter into the composition of plant food, and that they are transformed and elaborated through the life processes into the plant substance. If any single one of these elements is lacking, the plant cannot grow any more than can an animal develop when deprived of an essential food constituent. Of these elementary food substances, carbon and oxygen are obtained from the air and are taken in through the leaves. Hydrogen is derived from the water absorbed by the roots. The other seven elements, nitrogen, phosphorus, potassium, magnesium, calcium, iron and sulphur are supplied from the soil. Fortunately, most normal soils are abundantly stocked with a practically inexhaustible supply of these elements with the exception of nitrogen and phosphorus. Potassium is usually abundant, but probably because of the benefit so often resulting from its application as a fertilizer, it is commonly considered in the group of the so-called three essential elements, nitrogen, phosphorus and potassium.

Every bushel of corn that grows requires in its composition and removes from the soil one pound of nitrogen, .17 pounds of phosphorus, and .19 pounds of potassium. The stalks and leaves sufficient to produce a bushel of the grain require in addition one-half pound of nitrogen, .06 pounds of phosphorus and .52 pounds of potassium. It is obvious that the practice of constantly removing crops from the land connot continue indefinitely without depleting the soil of these elements of fertility and any system of farming whatsoever that disregards these simple facts fails in the very fundamentals of permanent agriculture. Most of the proposals for soil amelioration fail in this regard, for they neglect those two most important considerations, first the supply of plant food in the soil, and second, the liberation of plant food from its combinations.

SMALLER FARMS

The first proposition mentioned above; that is, "Smaller farms," seems on the face of it rather simple and reasonable, but nevertheless, there are some perplexing economical questions involved. It is sometimes true, although of course not always, that the amassing of extensive property is the result of superior intelligence. When such is the case, what advantage could come to the land by dividing it and bringing it under inferior management? It is, however, beyond my present purpose to discuss to great extent this phase of the question, suffice to call attention in passing to the fact that in other industries the largest enterprises are usually the ones that are operated most successfully and most economically.

Further we must not forget that although the more intensive practices upon which the theory of small farms is based would possibly result in larger immediate yields, yet these larger yields mean heavier drafts upon the fertility of the soil for "plants are not made out of nothing."

THOROUGH TILLAGE

This same consideration naturally applies to the next proposition mentioned—that of thorough tillage. I would not be understood in this statement as depreciating the effect of thorough tillage and good cultivation, for it is one of the most essential factors in successful agriculture, and we cannot emphasize too strongly its importance as a means toward increasing the yields. Moisture must be conserved and the weeds must be killed. But the point I wish to make is that we must not depend upon tillage alone for permanent soil improvement, for by its very operations we should expect an increased amount of plant food to be taken out of the soil, and consequently the obligation to make provision for the replacement of this plant food is all the greater. With our improved field machinery, there doubtless never was a time in history when it was possible to deplete the soil fertility so rapidly as is being done in this country today.

BETTER SEED

The next proposition on our list is *better seed.* As it happens to be my fortune to be engaged in that most interesting field of work, plant breeding as applied to farm crops, of course I should not be expected to fail to recognize in this proposition a most important factor in improvement of crops.

Prof. Wohltman, an eminent German authority, made the statement to me that according to his estimation the production of Germany has been advanced about twenty-five percent in the past forty or fifty years through the agency of plant breeding alone. In considering this remarkable progress, we should remember that some of the most important discoveries in regard to the operations of heredity were made within the last ten or a dozen years, so that in the light of this new knowledge, possibilities heretofore undreamed of have been opened up. In this country only a beginning has been made along this line of endeavor, but already results of tremendous importance have been accomplished. And in this connection I would like to mention that among the most valuable contributions that have yet been offered, especially along the line of breeding corn are those of your Ohio Agricultural Experiment Station—the product of Prof. Williams and his efficient corps of workers.

But as I hope to have the opportunity later of pointing out some of the possibilities of plant breeding and what may be accomplished along this line, I will not dwell further now upon this point except to suggest that so far as I am informed, there is no immediate prospect of the breeder being able to produce plants that will be made out of nothing.

The more we improve our plants and thereby increase our yields, the larger will be the draft upon the soil and the greater the necessity of providing an ample supply of plant food in the soil.

ROTATION OF CROPS

Of all the different methods proposed for the maintenance of the soil possibly none are more seemingly plausible than that of crop rotation. This is natural enough when we see the beneficial effect on land thriving under favorable systems of rotation as compared to that suffering under single cropping. As a most striking illustration of this point I can do no better than to refer you to that exhibit from the Ohio Experiment Station over at the exhibit hall where you may see side by side the yields of corn produced in the one case under a good rotation system of corn, oats, wheat, clover, and timothy, during the past fifteen years and in the other case the yields produced on land kept continually in corn during these same fifteen years. Those ears and stalks of corn tell this story more eloquently than pen or tongue can describe, and if there are any among you who may not have seen this exhibit or know of the work that it represents do not fail to take this opportunity to get into touch with the work of your Experiment Station.

This particular exhibit brings out in a most interesting way the fact that where the land has been kept continuously in the single crop either with or without manure, the yield of corn is gradually going down. In the rotation series, however, the corn yields appear to be thus far holding their own even without manure, while with a liberal dressing of farm manure, there has been a remarkable increase in the production.

Following are the figures showing the results of this work. They represent the average yield of corn in bushels per acre for successive five-year periods:

	First 5-year period	Second 5-year period	Third 5-year period
Corn continuously without manure..	25.25 bu.	16.76 bu.	10.43 bu.
" " with manure.....	43.13 bu.	40.11 bu.	34.62 bu.
Crop rotation without manure.....	31.89 bu.	30.82 bu.	31.04 bu.
" " with manure.....	40.73 bu.	49.52 bu.	59.75 bu.

In considering these results, however, we should bear in mind that these experiments cover only fifteen years, a very short period to be considered when we are dealing with the proposition of permanent agriculture. I wish we were able to look fifteen years into future and see how those ears would stack up in the baskets by the end of that time.

It is of vital importance in this connection to consider the results from land that has been kept the longest under observation. Let us see what some older fields have to teach in this regard.

A LESSON FROM THE ROTHAMSTED FIELDS

At the Rothamsted Experiment Station in England where experiments have been conducted for over sixty years, we find that simply a rotation of crops without addition of plant food has failed to maintain the productiveness of the soil. Compare the yields in the beginning of a four-year rotation consisting of turnips, barley, legumes (clover or beans) and wheat with those of a twenty-year average taken fifty years later.

	Turnips	Barley	Clover	Wheat
Yield per acre at beginning	1848-10 tons	1849-46 bu.	1850-28 tons	1851-30 bu.
Yield per acre 20-year av. '88-'07	1-2 ton	14 bu.	Less .5 ton	24 bu.

This is the experience in maintaining the productiveness of the soil through the use of what is generally considered one of the best crop rotation systems known on the oldest soil experiment fields of the world.

A LESSON FROM THE PENNSYLVANIA STATION

In our own country at the Pennsylvania Station, the data for twenty-five years shows this same fact that production is gradually declining on those fields which have always been kept under a good system of crop rotation, but which have received no application of plant food. Following are the records reported by Director Hunt in a recent bulletin from that station. In a rotation of corn, oats, wheat and timothy mixed with clover, where an acre of each crop is growing every year, the total annual production of all four crops run as follows:

Period	Pounds produced	Value
1882-86	14,679	$75.35
1887-91	14,339	75.46
1892-96	12,611	64.29
1897-01	9,562	49.16
1902-06	9,848	50.88

It is certain that crop rotation alone upon this soil has not been adequate to maintain productiveness.

A LESSON FROM THE ILLINOIS STATION

Will you have further evidence, turn to the records of the Illinois Station where we have the results of a rotation field started thirty-one years ago. In a three-year rotation of corn, oats and clover, the average of the last three corn crops amounts to 57 bushels per acre. The same system started sixteen years later (the land being in pasture in the meantime) on another part of the same original field gave in these same three years 64 bushels per acre. By this comparison we see that the old rotation field is declining in yield having gone down seven bushels per acre by reason of its being 16 years older.

Although it may be true that statistical averages would appear to show that the production of a country can be maintained over considerabled periods of time, we find that wherever long continued records have been kept of a given piece of land of normal type the best known crop rotation systems have failed to maintain production and the land has always declined in yield.

The difficulty with the statistical average is that it does not take into account the acquisition of new soil or even the abandonment of worn out land, nor does it take into account the improvement in crop production by means of better methods of care, cultivation, seeding and fertilizing, and so we are sometimes misled into the belief by these statistical averages that the stock of fertility is being maintained in our soils.

Having become convinced, as I hope you are, from all this evidence that crop rotation of itself will not maintain production, perhaps you ask, shall we then dispense with rotation? Most certainly not!, for we are absolutely dependent upon it for certain beneficial effects.

Rotation is essential in combating insect enemies and fungus diseases that prey upon our crops. It is of benefit in furnishing diversified farming. It is of utmost importance in the maintenance of the nitrogen supply, for we must depend upon the regular periodical growth of legumes such as clover, peas, beans, or vetch; which have the peculiar power to utilize the free nitrogen of the air, putting it into available form for succeeding crops.

Further the increased quantity of decaying vegetable matter or humus which may be supplied by a rotation is often of untold value in improving the physical texture of the soil. Moisture is better conserved and the conditions are improved for those essential biological processes some of which we are just beginning to understand. The presence of this decaying organic matter also effects the solution of the mineral particles, thus rendering available the mineral plant food for the hungry crops. Rotation is absolutely essential and every landowner should so organize his farming as to include a rational system of crop rotation, and having once established such a system, he should adhere strictly to it. This system, of course, may vary in details to suit the peculiar circumstances of soil, season, market, etc.

The purpose desired in this discussion is to dispel the erroneous notion which is so prevalent that crop rotation in some way increases the fertility of the soil.

Aside from the single element nitrogen, rotation adds no plant food to the soil, but on the other hand through the larger crops produced by reason of these benefits enumerated, it helps to reduce all the more rapidly the stock of essential mineral elements stored up in the soil.

This brings us back again to the necessity of providing plant food if we expect to maintain a permanent system of agriculture.

The practical question of course is, can this be done in an economical way? and the answer is, it can be done, and by a strictly grain system of farming as well as by a livestock system.

Referring once more to the fields at the Illinois Station, in the new series this corn, oats, clover rotation has given as an average for the last six years 64 bushels of corn. But by the use of the crop residues such as stalks and straw, thus taking away from the land only grain and clover seed, and adding a little limestone and some

bone meal which supplies phosphorus, the yield for these same six years instead of 64 bushels is 88 bushels. Now this is not a plan that can be worked out only on paper or in a small experiment plot, but it represents a permanent practical system for the corn belt and one in which the land is getting better as time goes on.

Possibly you may have observed that there is no mention of farm manure in this system, and this leads us to our next and last point.

LIVESTOCK HUSBANDRY

Under this heading let us briefly consider two questions. First, does the keeping of livestock necessarily increase or even maintain the stock of plant food in the soil? Second, is it possible to maintain or increase the fertility of the soil without livestock?

It may perhaps seem at first thought to be rank heresy to raise either of these questions. The teaching has been prevalent so long that livestock is necessary to the maintenance of the soil fertility that we have grown to accept this idea as a matter of fact, or indeed as almost a fundamental principle. Even at times when conditions have been such that livestock husbandry has not been profitable, this branch of agriculture has been looked upon as a sort of necessary evil to be tolerated for the sake of the soil.

If this idea is true, then all grain farmers must either become livestock farmers, or else look forward to the prospect of soil ruination. Let us consider a few facts in this connection.

HUMUS SUPPLY

Animals destroy about two-thirds of the total dry matter of the food consumed so that on the average there are less than 800 pounds of dry matter in the manure produced from a ton of dry food. Then so far as the quantity of humus is concerned, one ton of hay plowed under amounts to about the same as the manure produced from three tons hauled off and put through the animals.

THE NITROGEN SUPPLY

A ton of farm manure contains on the average ten pounds of nitrogen. A ton of dry clover hay contains forty pounds. A bushel of corn contains one pound of this element. If we grow on an acre an 80-bushel crop of corn, we remove in the grain therefore 80 pounds of nitrogen. In order to restore this quantity, eight tons of manure are required. But a two-ton crop of clover plowed under will furnish the same amount.

To supply eight tons of manure to every acre under cultivation is an impossibility unless feed is brought in from an outside source, while to turn under a two-ton crop of clover is a comparatively simple matter.

It is true that many farmers have succeeded in actually building up their land through livestock by feeding grain purchased from their neighbors, thus transferring the fertility from their neighbors' soil to their own land—a process of "robbing Peter to pay Paul." Also some smaller countries by pursuing a policy based on these same lines have markedly increased their crop yields.

I think these few suggestions will answer both of our questions proposed above so far as humus and nitrogen are concerned. Regarding potassium we need not be especially concerned as fortunately our normal types of clay soils contain a bountiful supply which should be rendered available through decaying organic matter.

THE PHOSPHORUS SUPPLY

The one other element of plant food that must be seriously considered is phosphorus. Large amounts of phosphorus are removed in grain. Smaller amounts are removed in animal products chiefly in the bones. In either system of farming, therefore, whether grain or livestock, if the supply in the soil is to be maintained, we must bring phosphorous in from some outside source.

There are a number of sources of phosphorus such as bone meal from the packing houses, basic slag from the iron foundries and raw rock phosphate from large natural deposits or mines. This latter material furnishes under present market conditions by far the cheapest form of phosphorus. In applying it, however, it must be made available or soluble before the crop can utilize it. Intimately mixed with decaying organic matter the phosphorus becomes available and very great profit results from applying such material mixed with farm manure. As the most thorough going investigation in existence on this matter I may mention the work of Prof. Thorne, of your own Ohio Experiment Station, and refer you to his Bulletin No. 183 for complete information upon this point.

But the grain farmer, who does not have the manure must depend upon his plant material for his organic matter, and by plowing under a good growth of clover along with the finely ground raw rock phosphate he brings about the same effect in rendering available the phosphorus. Several years' experience in various localities in Illinois have proven beyond question the advisability of this practice.

That a system of pure grain farming can be operated in which the soil grows more productive as time goes on, and without the aid of animal manure, is now established and such a system which is practical and profitable is now being actually demonstrated by the Illinois Experiment Station.

I would not be understood in these remarks as attempting to discuss the relative profits of these two systems of farming or as advocating for a moment the abandonment of livestock husbandry. A broad agricultural policy should include the encouragement of both of these systems. It is simply my purpose, briefly stated, to point out the importance of considering plant food supply in either system and the possibilities by so doing of establishing prosperous, permanent agriculture in grain farming and in livestock farming.

The Ohio Farmer Trophy Cup

REPORT OF THE CORN COMMISSION SESSION

Dr. W. O. Thompson, O. S. U., Columbus
H. W. Robinson, Greenspring — O. E. Bradfute, Cedarville
C. G. Williams, O. A. E. S., Wooster — T. C. Laylin, Norwalk

Meeting called to order by Dr. W. O. Thompson.

Mr. Thompson—I suppose this meeting is to be what our school ma'ams call a Round Table. The teachers have a way of getting together and discussing the vital problems of their own experience and theories as relating to schools with more or less informality, and somebody presides and everybody else is free to say what he thinks, and usually one or two are called upon to start the discussion a little, and then some one else will disagree or reinforce as he sees fit.

The list of questions, which I assume you all have in your hands —this little printed card here—is a list of practical questions pertaining to the problems of production on the farms in which it is assumed all of you have had some experience and therefore, some wisdom. There is no law or rule requiring the order of these subjects. As among teachers we sometimes select the topics we are most interested in. Do not have any hesitancy in calling out your preference. Therefore, the freer you are in this meeting and the more you break into it, the more we can make out of it, the better for you and for us. Now here is a meeting in which the doctrine holds good that you can't take out any more than you put in. In other words, if you haven't brought any experience you cannot take any experience away. We are here simply as associates and friends to discuss these topics. It appears in the announcement that the desire was to bring in certain men as witnesses to testify as to what they know or do or do not know on the topics mentioned. To give the thing a start this morning I will call on one or two or three men who are here and let them respond at once. Now if Mr. Hummon of Liepsic, will have the kindness to break in and tell us something about soil fertility we will proceed at once.

Mr. Hummon of Putnam county—Farmer friends of this meeting, we have a number of questions here this morning in this Round Table, which will be of interest to us, if we take hold of it and discuss the matter. I want to call your attention first, to question 4, which I think in our community is one of the most essential questions for us this morning, the subject of "drainage," the foundation of the crop. We know that this past year, in our locality especially, we had one of the most unfavorable seasons, for the production of good crops, that we have had for many years. The fore part of the season was very wet and then later on it was very dry, you know how those two act together. Without proper drainage a great deal of the crop was destroyed in our locality.

We live in Putnam county in what was formerly known as the Black Swamp of northwestern Ohio. Some of you people know about and a great many of you have heard about this area. Without drainage in that section of the country it was impossible for the people to farm and make a fair living. Therefore one of the foundation principles of that country was to lay out a proper system of drainage, first open drainage and after that came a system of under drainage. The last is what I want to speak of now. We know in our section it is very essential to have a proper system of under draining, because with the country so level without a proper system of under drainage, we get too much water on the surface which is detrimental to crops.

Last season the rains came so close together and in such quantities that with all our drainage on the best drained land, we had quite a bit of water that fell and ran off of the top. We all know what that means. The water carries away the humus of the soil. One of our brethern spoke yesterday about having a good crop of corn regularly with never a bit of fertilizer put on it. Well, gentlemen, our humus overflows from our soils onto his, and he gets the benefit. (Laughter).

We find that it is beneficial to have the water get away through the drains and not have to evaporate at the surface of the soil. We know that evaporation causes a coolness at the surface of the soil, as you have had demonstrated in taking a bath, that as soon as you get out and the air strikes you, you get cool. It is not the coolness of the air but the evaporation of the water. You know a wet soil is cooler than a dry soil. Corn needs an awful lot of warmth, and if we have the proper system of drainage we have a warmer soil.

The rains as they come from the heavens carry a certain amount of fertility, and if they are permitted to go down in the drains they leave the fertility, but if they fall upon the surface and are not properly conducted away by drains the fertility will go off with the surplus water and be lost. We also know that there are decided advantages in a properly drained soil through the aeration of the soil. While the ditches are not carrying off the water they are performing another good mission, taking into the soil the air through the channels of the drain. The aeration of the soil is of benefit in helping to set free the plant food that is in the soil for the use of the crops.

Now, then, we take it for granted that all our farmer friends here this morning have properly drained soils and are ready to combat with all these different conditions of weather, but remember we have a number of friends at home that do not hear what we are going to say this morning, and have not the proper system of tile drainage. They are the ones that are suffering and they are the

ones that we as an organization are trying to help. We are trying to help ourselves and them as well. I was in a field of corn the other day in our immediate neighborhood of something like fifteen acres that was planted along about the first of June. It was never cultivated and no doubt was under water a good deal the fore part of the season. The consequence was the grower did not receive enough from the entire field to get his seed back. That seems to be a strange and sad lot in a civilized country that we claim to have down in Putnam county. But it is a fact. That man had more than he could handle. He put out something like 60 acres of corn. Now you see he had better put out 10 acres on a thoroughly drained soil than to put out 70 acres on an undrained soil and get nothing from it.

One of the questions before us this morning is along the line of soil fertility. One of the things we should try to keep up is the humus of the soil, and our clover is one of the best means we have of adding humus to the soil in a wholesale way. I would like to say a word or two on our plan of handling the clover crop. Last season we had a 16-acre field of clover on land as we have described. We harvested one-half of the crop for hay and the other half we clipped back about the 20th of May. We left the second crop grow for seed, threshed it out and returned the hulm to the soil, to be plowed under. This last summer we had this field in sugar beets and grew about 13 tons to the acre. When we have this field in clover again we expect to harvest the alternate end for hay and turn under the other, so that once in six years in a 3-year rotation we will turn under the entire growth of the clover with the exception of the seed. By that means we think we will be able to keep up the humus and fertility on that soil. We have a limited amount of barnyard manure to apply on this clover sod as the seasons come and go, thus enabling us to grow greater crops of clover and get more humus. We use alsike and red clover mixed and are very well pleased with the idea because you know alsike grows very rank and is very apt to fall down when we have a little too much rainfall as was the case this year.

Now, as to the system of drainage which we are using, I have a chart of it, but I didn't want to bring it along because it would take too much time to get into the details. When we bought that farm in '86 there were only 40 rods of drainage in it, and now we have 900 rods. We have some drains as close as two rods apart and some 4 to 6 rods in some of the blacker land, and we find in a season like the past one that we still have need of more drainage and larger drains in some certain sections of the farm to carry off the water more rapidly. We haven't been able to see the results that we expected to see under such conditions as we had this last year, because the rains were

excessive and beyond anything we ever witnessed before in that locality for that season of the year. We may never see a year like this again in a number of years, but we must provide for these unfavorable seasons if we want to raise good crops annually. By a thorough drainage, properly placed in the soil, we will find that wet seasons can be overcome.

Now, there are many drains in our locality that have been put in carelessly which can not do the work they should do, but where they have been put in properly there is no question but that they will stay and be beneficial for years to come. We find too in the early history of our lands in that section of the country the soil filled with vegetation, the roots of the forest, and it didn't require drainage as close as it does at the present time. When they first began they drained 6 or 8 rods apart and they thought that was thorough drainage, but now they are coming to see, since the humus and the roots and different things that help keep up the soil are rotting out and decaying, that it requires an extra drain between those drains, so a number of our people are redraining their farms, doubling the number of drains. I do not think there is anything that will increase the crops in Ohio more than the proper drainage of the swamps and wet places. In coming over yesterday I noticed many places where the corn was simply weeds which indicates too much water in the past season, and those very places if drained out would make the very best corn land, since this crop requires a well drained and warm soil to do its best.

Dr. Thompson—I want to offer a word of testimony in this connection. In my own experience this year I had the best corn I have had in the nine years since I owned the farm. There is always a season in early May when you can plant corn if you are ready, and then there comes a wet season. Some people believe in waiting until that is over and at times I have had to do that, but this year I got my corn in before the wet came. I couldn't have done this five years ago, but it is well drained now. Some people said "that corn will never come up," but it did come up and produced a good crop all around, and I feel that the drain justified itself as a matter of experiment in corn production, and it certainly did give us a crop, whereas if I had waited until the latter part of May or the first of June when I was beginning to plow, I think I would have had what they had, a less desirable crop of corn.

Now this question is open, and you can fire any question you care to at Mr. Hummon to keep the matter going. We will be glad to hear from anyone who has had any experience in this line.

Mr. August Stabler of Maryland—I don't live in Ohio—

Chairman—I am sorry for you, Mr. Stabler, (Laughter) but you are not to blame for that.

Mr. Stabler—I was very much interested in what the first speaker said and I can agree with his conclusions, but it seems to me that when he tries to explain, he hasn't reached all the whys and wherefores, and I thought probably that inasmuch as the farmers present do not seem to understand why drainage is necessary for the benefit of the corn crops and other crops I could possibly throw a little light on the subject.

In the first place it favors the warmth of the soil in the spring. A porous soil warms up quicker than a soil that is saturated with moisture, because there is more oxidation going on in the porous soil. We know one of the means by which the soil is warmed is not only the heat from the sun but the fermentation or oxidation going on in the soil. Now if the soil is saturated with water, it cannot get the oxygen to carry on that process. Second, the air is needed by the root of the plant; corn plants and all other plants need air for their roots as well as their leaves to carry on the vital processes going on there in the soil. Third, the bacteria which cause the assimilation of food material need air.

Now when we haul out a load of manure and put it on the soil, it is not plant food when it goes in there. After it goes in there it has to be worked into food by bacteria. These bacteria do not work well when the soil is saturated with water, they require oxygen for their best life and growth. A soil that is saturated with moisture is much more likely to become acid than land that is well drained and aired. It is a matter of common experience, that well drained lands are usually less acid. The clovers do not grow well in soils that are saturated with moisture all the time. The alfalfa, red clover, clover plants of whatever kind want well drained soils. Why? Because they have to have on their roots the bacteria that cause assimilation of food material. Those bacteria cannot live in the roots if the soil is saturated with water, and we can't have the process of obtaining nitrogen from the air going on in a soil that is saturated with water.

The effect of the phosphorus on the soil is another thing. Phosphate of lime is the form in which the plants assimilate their food. Now if there is an acid condition of that soil that phosphate of lime is dissolved and other combinations are formed. You get rid of your phosphorus. Wet soils are nearly always deficient in phosphorus; they are nearly all deficient in bacteria; and they are deficient in warmth, three very essential things to plant growth.

A Member—I would like to ask the gentleman whether alsike won't grow better than the medium red clover?

Mr. Stabler—It will.

A Member—Why?

Mr. Stabler—It is one of those plants that seem to have become immune. If you have your soil absolutely saturated with water, it will kill the alsike as well as the other. It will however stand more wet than the other.

Mr. Wiley of Licking county—Perhaps it is unfortunate, but we do not all live in this absolutely level country. I think there are a number of people who have been attending this meeting who have lands that are not as level as that floor and do not absolutely overflow. In our farm we have some second bottom land, a rather rich gravelly sandy loam, in which there are places that, while they would drain out in time, we have found by 20 odd years' experience it pays to drain. In going about this year I have seen in places, where in ordinary seasons no drainage would have been necessary, great spots, of an acre or less, that have very little corn. Now a little tile draining in there would have made it all good corn, because it would have affected the very things these gentlemen expect.

Our rotation may not be the wisest, but we have solved it so far upon this general principle. I believe it is an obligation, a moral obligation laid upon us by the Creator to leave our farms better than we received them. It is not merely a question whether we make more money or not, but also whether the people of the next generation get a better or a poorer land. We raise a great deal of clover. I generally mix a little alsike with my red clover. Why? because in a wet place I am pretty sure to have a good clip of clover on it, and then mixing it makes a better hay, in my opinion. We have three barns and barnyards and all the manure we make from our various kinds of stock goes on to that clover after it is cut and the next spring it goes into corn.

In the spring we sow our clover twice. Now that may not be absolutely necessary, but we have never failed to raise clover by this method. After harvesting if there is a good second growth we pasture. If we take off seed we always return its equivalent. Now we believe we have succeeded in increasing the fertility of the land. Some take two crops of corn and two crops of wheat, but we are lazy at our place and make one do. If this is not best I want to know it. That's my object in coming here.

Mr. Graves of Paulding county—Before Paulding county was properly drained it was too wet, we couldn't produce any corn to speak of. The timber that grew on that land was originally cottonwood, water elm, black ash, sycamore, and such trees that prospered

only in ground that was very wet. It would produce trees of the cottonwood variety that towered nearly one hundred feet to the first limb and four feet across the stump, and the same was true of the sycamore. But we found after the timber was taken off that we could not produce corn or oats in proportion to the large timber. The result was the people had to turn their attention to drainage, and we regard that as the most important matter for laying the foundation for crops in our county. The land is practically level, almost as level as the floor, and we found it necessary to drain. In the first place we drained about 8 rods apart where the ground was new and open and porous as the gentleman here explained. We got along nicely raising bumper crops. But later the humus became exhausted to a certain extent and now we find it necessary to drain about 4 rods apart, and that land, some of it, today is producing under the proper system of tile drainage about 100 bushels of corn to the acre.

A Member—How deep do you drain it?

Mr. Graves—It depends largely upon the fall. Where we can we drain 3 feet. The deeper the tile are put, the further it will drain from either side. The county being level it is not always practical to lay your tile that deep.

A Member—Closer than that is there not danger of grass roots? Don't they get chocked with grass roots?

Mr. Graves—No, we are not bothered in that respect. Never have been yet; there is perhaps a little danger of the tile becoming choked in case you raise alfalfa. Second to drainage I regard cultivation as the next important thing in laying the foundation for successful crops. With good drainage and proper cultivation we have the conservation of moisture. I think we can then raise a good crop of corn.

Many of us, I think, in fact the majority of corn growers in the state, lay by their corn too early. We don't do that. We aim to stir the soil as soon as possible after every rain with a view to conservation of the moisture. If we get a rain a day or two after the corn has been stirred we lose that work, but we have the benefit of the insurance against a possible drought that might have licked up the moisture in the soil to the detriment of our crop. I don't think you can stir your ground too much, as long as you don't go too deep. We have practiced cultivating the soil through July and August as many times as it seems necessary with a view of insuring against a possible drouth.

A Member—What kind of cultivator do you use through July and August?

Mr. Graves—We have a V-shaped cultivator, with, I think, 13 spiked teeth in it, one end of which is diamond pointed, and the other end of which is an eagle claw. We use that after the corn gets large and cultivate about two inches deep.

Chairman—Shall we continue the discussion or proceed to question No. 10? The question is, "Compare yield of corn from seed which has been carefully graded for uniform kernel with that from ungraded seed."

Dr. Thompson—I bought a corn grader last spring and graded the seed corn myself. I tested the corn planter and that corn planter did not miss one in 300 in the distribution, and I thought if it would do that well I would be satisfied. The result was that in spite of all wind, weather and all other reasons, we had the best stand of corn we have ever had. We selected our seed corn and then we graded it and got a very good result.

A Member—Do you thin your corn after you have graded your seed?

Dr. Thompson—No, sir.

A Member—You just plant two or three grains and let it go?

Dr. Thompson—Yes; aim to plant two or three grains and let it go at that.

A Member—How far apart do you plant?

Dr. Thompson—My planter is 3 feet 6 inches or 3 feet 4 inches, I have forgotten which.

Mr. Nuding of Mercer county—Have you any figures on drainage?

In a variety test which we were carrying on we found that the checks on either side of the tile drain yielded 77.8 bushels. There was a check right over the tile drain that ran 109.51 bushels. We thought this was a most remarkable proof of the efficiency of the drains.

A Member—How far did you check it, did you say?

Mr. Nuding—The checks were the 4th plot from the tile drains on one side and the 5th on the other side.

A Member—How many rows in a check?

Mr. Nuding—Two, and they were planted 3 feet 6 inches apart.

A Member—What can you say about the adaptability of that seed corn to that section of the country?

Mr. Nuding—This was the same seed on the checks.

A Member—What was the average on the checks?

Mr. Nuding—70.21 was the average of all the checks. The checks on either side averaged 77.08; being effected some by the tile drain.

A Member—Do you mean to say that if you had all that field drained properly you could increase the yield by the amount of the difference?

Mr. Nuding—It shows up that way.

A Member—Have you any figures of subsequent years producing like results?

Mr. Nuding—No, sir; this was our first year with a variety test.

A Member—Was this the first year after the drain was put in?

Mr. Nuding—Yes, sir.

A Member—Did you have a wet season or a dry one?

Mr. Nuding—It was wet the fore part of the season and it turned off rather dry later in the season.

A Member—Did the corn come up quicker over the drains than it did in other places?

Mr. Nuding—I could not say; I did not notice it.

A Member—Did you have a better stand there?

Mr. Nuding—It was all thinned to a uniform stand.

Mr. Udaly of Butler county—I want to say I have a field under which I put a drain. I am a crank on drains. This field has had these drains in 14 years. While I have not had it planted in plots in any way there hasn't been a year, let it be the dry year or the wet year, when I couldn't see a difference in the corn near them and that which was farther away. I remember one season in particular. I don't think there was a particle of water that run out of those drains that season, yet I could see the corn was larger and better near the drains.

Chairman—Some of our witnesses have testified they need 8 rods, some 4 rods; I would like to know if any can testify they need nearer than 4 rods.

Mr. Galehouse of Wayne county—We have been doing some tile draining in the past three years, and we find we get better results where the tiles are 33 feet apart, and we even put them closer in some places. Last year we tiled a field of eight acres and we put them 33 feet apart. It is not flat, it is rolling, and that field has ordinarily been producing on an average 30 to 40 bushels of corn per acre. In the lower part of the field the crop where it was usually drowned out we had the best corn this year. Of course that is discounting the fact that the white grub worked on it considerable in spots.

Dr. Thompson—How deep were the drains?

Mr. Galehouse—We try to get them down from 20 inches to 30 inchs, some of course are deeper.

Dr. Thompson—What was the size of your laterals?

Mr. Galehouse—Three inch laterals.

Dr. Thompson—The character of your soil?

Mr. Galehouse—It is a very stiff yellow clay. We don't think it advisable to get them down too deep. There are a few tile drains put in some twenty years ago and not working satisfactorily. I came to the conclusion that they were too deep to do the work. The yellow clay had been dumped in without any other soil on top of the tile, and the water simply cannot get down to the tile. That yellow clay subsoil will hold water two or three days at a time. In putting in our tile we always spade in some of our top soil. We think it is the proper thing to do.

H. G. Robertson of Muskingum county—I have had some experience along this line. Three years ago I wrote the Experiment Station regarding my land, and they made the suggestion that possibly it was wet and sour. As a result I started in to drain some of it. I put the tiles in a little bit deeper, about 2 1-2 feet on the average. Last winter we put in eight miles of it, and since that we have used lime at the rate of about 1000 pounds per acre. Before doing this we could not grow clover, but since then we grow clover every place. About three years ago we had 35 bushels of corn to the acre, and this year we about doubled this. This year there was so much difference in the yield and in the appearance of the crop, that people keep asking the cause. Nothing but simply the drainage and the lime.

Our clay is very heavy. We dug up some of the drains put in too deep, and we find 2 feet to 2 feet 8 inches is as deep as we dare put them. The question has been in my mind, are we putting them too far apart. We have been putting them about three rods apart. We expect to put in about three carloads, and I would like to know from other men here who have had experience with heavy clay what they found out about it.

Mr. Markley of Morrow county—We are underdraining our place just 50 feet apart. In ordinary years the drainage was sufficient, but in this exceedingly wet season the water interferred with the growth of the corn half-way between the tiling. This is the only season that 50 feet was not sufficiently close drainage.

A Member—What kind of sub-soil?

Mr. Markley—Clay sub-soil.

A Member—How deep were your tile?

Mr. Markley—Two feet always; never more than that if we can avoid it.

Dr. Thompson—The theory is for every inch you go down you will drain a foot on each side. The figures are true if the sub-soil is porous enough. Our subsoil refuses to act.

A Member—Do you believe that 24 inches deep will answer?

Mr. Markley—Yes, sir; in every case excepting this year, during the excessive heavy rains.

A Member—How long since was that tile put in?

Mr. Markley—In this particular field it was the first crop of corn after tiling. We expect better results later. Our outlets are always in large mains. We ought not put in the tile without a good outlet.

Mr. Galehouse—May I add a word to this discussion regarding the distance of tile drains apart. We have a neighbor, not on an adjoining farm, but with a farm in the same kind of soil some fifteen or eighteen years ago, who put in his tile from 50 to 60 feet apart. Ordinarily they seemed to do the work reasonably well, although some seasons the spaces between did not do so well; but within the last four or five years he has doubled the amount of tile on most of his farm. He said that he couldn't get results the way he was farming, that he would rather have tile 20 feet apart than 30 feet.

(Dr. Thompson then withdrew and Mr. Williams took the chair).

Mr. Sears of Belmont county—There is one question I want to ask and that is what is the minimum fall at which it is safe to lay the tile. I live in the hilly county of Belmont, and have one flat field of heavy tenacious clay, and what I want to know is how much fall it is necessary to give this tile.

Mr. Graves—I am from Paulding county, a level country. Our drains are necessarily very level and we regard a drain is all right just so the water is gradually leaving it. It depends more on the pressure of the water in the soil to force the water out, as you know water will seek its level.

Chairman—Mr. Graves says nearly on a level.

A Member—In order to settle that I asked a civil engineer what was the customary fall. He said one inch generally to 100 feet. He said, sometimes five-sixths of an inch to a hundred feet. And now as to the air pressure forcing the water out, that depends upon the outlet. If you have a good drop at the end of your outlet your water will come out, but it will not do it unless you have that. My experience is we ought to have at least the fall I mentioned.

Mr. Rice of Trumbull county—This question of tile draining is very interesting to me, and I came here to learn. I am from Trumbull county. Right where I live we haven't done much underdraining until just lately. A local dealer had a carload of tile all summer and couldn't sell it, but since we had the agricultural extension school of the Ohio State University, he has sold that carload and shipped in another.

There is a question I want to ask Mr. Williams. Our land is a mixture of sand and gravel, but we have a great deal of clay loam. Where I am it is rolling, because it is near a creek. It is a very well watered section adapted to dairying, but our land has been running out, and I want to know if it would pay to underdrain in the hills in the clay loam even on the hill side.

Chairman—Mr. Rice asked the question whether the upland should be drained. I think the testimony from Muskingum county would aswer that question.

I think it is necessary to stop at question No. 4. We could easily spend the whole forenoon on this question. We will now take up No. 10 and go on with it. Please give us some definite information if you can, talking to the point. Let us not discuss rotation of crops on this topic. "Compare yield of corn from seed which has been carefully graded for uniform kernel with that from ungraded seed."

Mr. Galehouse—I have used a seed corn grader for two seasons and find we can get a much better stand of corn by the use of the grader than we ever had before.

Chairman—Has any one made an accurate comparison?

Mr. Cole of Clinton county—I think I can give some information on that subject. Until two years ago we didn't use a grader, and we were raising from 45 to 48 bushels of corn to the acre with about two-thirds of a stand. For two years we have used a grader. It is manufactured at Wilmington, Ohio, at a trifling cost of a dollar or a dollar and a quarter, and we have been running all our seed corn through that grader. Last year we increased our stand, three stalks to the hill we aimed to plant, and it was almost a perfect stand. I am satisfied it pays greatly to grade the seed corn. That has been our experience in planting about 200 acres of corn, and we make it a business to run it all through the grader.

Chairman—Have you been testing your seed corn carefully?

Mr. Cole—We have been taking better care of our seed corn and are careful not to allow it to freeze. We put it away in the fall before any freezing weather where it is kept thoroughly dry; we use the furnace room in the house, but I think I can safely answer your question by saying that we have been testing the corn a little more carefully, but that wouldn't account wholly for the difference in the stand. I can safely testify that we get a better stand when we grade the corn.

Mr. Herrick of Summit county—I have used a grader for two years, and increased my yield about one-fifth.

A Member—I wish Mr. Herrick would tell us whether he planted some that was graded along side of a field that was ungraded and got that increase or whether it was a supposition.

Mr. Herrick—It was supposition. I didn't plant any check, but I have planted for a good many years from observations, growing 30 or 40 acres each year. Since we got the grader two years ago, and planting with our horse planter, we could get an almost perfect stand, and it seemed to come up and the corn got better. In the old fashioned way it might be five or six feet without any stand at all, and my best calculation from observation is that our yield is increased about one fifth.

Mr. Begg—A year ago at a corn show here a neighbor of mine purchased a corn grader, and we have had very satisfactory results. We cannot tell as to the increase of the yield because we didn't plant one part of the field graded and the one part ungraded, but we do know we got a more uniform stand.

Mr. Dobbins—I believe I express the sentiments of the house when I say we would like to have an expression from the chairman himself as to the use of the grader. There is not a man in the house who has had a better chance to experiment.

Chairman—I am going to call upon a man who has made some actual experiments in the uniformity of stands. I think the principal point that has been made with the use of the grader, we get a more uniform stand. I happen to know Mr. Montgomery has tested that out. We haven't done so.

Prof. Montgomery, Agronomist of the Nebraska Experiment Station—Gentlemen: I am a great stickler for making experiments on every farm. The point Prof. Williams insisted on, "Have you compared the graded with the ungraded patch. Have you compared a drained strip with an undrained strip." That is the only way we can settle this question. There are so many things that will support a theory, if we just have a theory. For example, in our state I have urged the farmers to use a roller on winter wheat, and have asked them as a personal favor to me to leave a strip right down through the middle of the field unrolled. I don't want them to take my word. I want them to make an experiment out of it. I always ask them to leave a part of the field untreated, and then they got the test in their own farm.

Now, in regard to this question of using a grader I want to say there are a lot of interesting problems that come up. The one question is, whether it is important to distribute the grains uniformly or not, whether if we plant a given number of seeds per acre we will get just as good a yield. That is the point at issue. It cannot improve the corn in any other way.

I started some experiments a few years ago in this way. I took one series of plots and planted absolutely three grains, then adjacent to this another series of plots, two and four grains per hill, keeping

the same number of grains per acre; two and four being the same as three and three; and another, one and five; and another, one, three and five, four series in all. In the first they were distributed absolutely equal and then varied in the others. I kept the record for three years, and I was much surprised to find that there had been a variation of less than two bushels to the acre between the different plantings. In fact, the last, alternating one, three, and five stalks shows an increase of one-half bushel per acre. That seemed to be evidence that if we keep the same number of stalks per acre we get about the same yield whether or not we have uniformity of distribution or somewhat unequal.

If you will take Prof. Williams' last bulletin you will find in there the rates of planting, where they planted 1, 2, 3 and 5 grains per hill for several years. There was practically no difference whether they planted 2, 3 or 5 grains. The plant adjusted itself to the conditions. It don't make a bit of difference between 5 and 3 and even 2 grains per hill seemed to yield almost up to three grains. We find that three, four and five grains per hill give about the same yield, the plants simply adjusting themselves to the conditions and the ears becoming a little larger or smaller, so that they balance up. One grain gives 64 percent as much as 3 grains, 2 grains per hill instead of giving two-thirds as much as 3 gives 90 percent as much by simply adjusting themselves. One grain her hill, instead of giving 33 percent as much as three grains gives 64 percent, showing that you get practically two-thirds as much with one grain as you can get with three. You will find if it is planted too thick the corn becomes smaller. At the Illinois Experiment Station on one class of experiments covering several years, in which they tried the method of distribution but keeping the same number of seeds per acre, bears out the same point. Now a number of experiments at other Stations indicate that if we keep about the same number of stalks per acre and if the distribution of seed is reasonably uniform that the yield per acre will not vary very much. Of course I can see extremes will give different results, but if reasonably uniform I cannot say from experimental evidence that there would be any variation.

And when you get to the stalks per acre again, the Illinois experiments show that there was little difference when they had anywhere from 11,000 to 18,000. 11,000 stalks gave about the same as 12,000; 14,000 as 15000. So you might say all the way from 9,000 to 18,000 stalks per acre, if the rate of planting is anywhere between that, the yield would be practically the same. You can see there is a vast adjustment of the plant. Now, it is not expensive to do this

grading, and certainly does no harm. But just how much increased yield we get, I don't know. The only way to learn would be to make the test with careful records and then you will get at it.

A Member—What would be the use then of thinning out if you have five stalks in a hill?

Chairman—Evidently there is not very much. If you would take the last bulletin of the Experiment Station you will find that there is little difference in the yield between three stalks per hill, and four and five per hill.

Mr. Begg—He has started in my mind a very important issue here in regard to local environment. Now, the question comes up to me is, "Have you made these tests on a little tenth-acre plots that are common at the Experiment Station?

Prof. Montgomery—Yes; made on tenth-acre plots and duplicated three times.

Mr. Begg—Is it not a fact that tenth-acre plots are more exposed to sunshine and air than a field of 25 acres, and a plant, even though it was in a hill that had five stalks in it, would have more atmospheric space to it than it would have if it were standing out in the middle of a ten acre field? Now it seems that the adjustibility of the corn does not agree with the facts in the corn field. This last year we graded our corn, and my son and I did it, and through some little mistake, a wrong wheel in the planter or something, we planted three to five grains in the hill. He thought he would thin it out, but his work pushed him and he didn't get to do it, and a short dry spell came in July about the time it was earing, and I noticed that it was the smallest nubbins and the smallest yield per shock of any on that farm. I think it is possible that these little tenth-acre plots have more atmospheric space and sunshine.

Chairman—Our tenth-acre plots at the Ohio Experiment Station are planted solid, they are usually in a ten or fifteen acre field, so the conditions are not so very different in a tenth-acre plot as you think. In our wheat plots we have a two-foot path between our plots, but in the corn plots we plant them solid, you would not know whether it is tenth-acre or ten-acre plots.

Mr. Sears—We have been conducting some experiments along this line, not particularly on account of thick and thin planting as as along other lines. I can say in regard to three stalks we got 10 bushels more than two, and in four stalks we got 2 bushels more than from three stalks; but the percentage of merchantable corn decreased as the percentage of thickness increased. In other words we got nearly as much merchantable corn from two stalks as we did from three stalks.

Mr. Hummon—This past season I was determined to raise an acre of corn that would be heard from, but none of you have heard from it. I will say what I tried to do. I planted a piece of corn with graded seed on thoroughly prepared and drained land, and I planted it double, splitting every row, with a planter that planted three grains to the hill. We got it in just about the way we wanted it; we got it 21 inches one way and 3 feet 6 inches the other. One acre of that I thinned down to two stalks to the hill, I was going to tell you about it when we came to the corn show this winter. Then the other acre I left with three stalks to the hill, just to see what it would do for me. Then on two acres of that piece I set the planter for four grains to a hill. And I planted it that way, the consequence was the fore part of the geason being very wet and adapted to the growth of fodder that corn grew to the height of about ten feet before it showed a tassel. When the drouth set in the large amount of foliage took up the moisture and it failed to shoot, or as some say it shot and missed the ear. There was a great percent of these plants never eared out. And when Brother Sandles sent me the questions and asked as to how I planted it and how I conducted it, I had to tell him I fell down. That corn was cultivated seven times during the season.

A Member—How far apart were those rows?

Mr. Hummon—Twenty-one inches one way by 42 inches the other.

A Member—Have you ever tried planting 3 feet apart each way?

Mr. Williams—That experiment has been made carefully by the Illinois Station and repeated half a dozen places with better yields by having the rows a little closer together and less plants in the row.

I am glad to see that Mr. Sandles of the State Board of Agriculture has dropped in and he will now address us.

Hon. A. P. Sandles, Secretary of the Ohio State Board of Agriculture—Mr. Chairman and Gentlemen: I not only dropped in but I was sent for and brought here by two husky looking fellows who from all appearances have their board bill paid and weigh more than I do. You are certainly in good business here. I like to shake the hand of a man and take off my hat to him, who is willing to do something for the good of a cause. I like that man who is willing to give more than he expects to get. I like that fellow who is sometimes willing to lift and not always be a leaner. The work you are in, the object and purposes of your Corn Improvement Association are to better conditions, I think we all appreciate the present high prices. Various reasons have been assigned why prices have gone up. A part of the blame is upon the broker and commission merchant and the retail dealer; but the fact still remains that we do not have a

surplus of food supply in this country today. The farmer is selling everything he has to sell and still the cry goes up for more. The great question before this country today is how to maintain the fertility of soil and increase the average crop yield per acre.

Mr. Brown, President of the New York Central Railroad, made an address a few evenings ago in New York City. He calls attention to these facts and says that one of the greatest questions before our people today is how this nation is to feed itself. The object and purpose of the Corn Improvement Association is to induce better farming, to induce farmers to mix brain with their toil and their sweat. My good friends, you may sometimes feel a little discouraged, you may sometimes feel that farmers are not so much interested in their own business as they ought to be. That is true. I have had the experience of going to business men in my own town and getting them to give two, three or five dollars for a farmers' institute or corn show. That money to encourage farmers in their own business. I have found farmers, who could better afford to give money than the business man, absolutely refuse to give a twenty-five cent piece. Farmers ought to be wider awake. The farmer ought to think a whole lot about his business. He ought to be as progressive and capable of pushing his business to the front as any other man in any other business. I have talked to Mr. Goddard and Mr. Shoesmith about corn. They dream of corn; they certainly have the corn religion.

A few weeks ago I had the pleasure of attending the National Farmers Congress at Raleigh, N. C., and heard Mr. Wilson make a remarkable statement of conditions in New York State. He found things to be true that he could hardly have believed if he had not seen them. On account of careless, negligent, ignorant farming the land has become so barren and unproductive that in some sections it would average every third farm abandoned, thrown out to waste, and the home deserted. That is a sad spectacle. If that is true in New York, and if New England and some of those older countries have had that sad experience, why is not your association in Ohio worth while? Why is not your association doing a good work in trying to educate and to give examples, if you please, to the farmers how to increase their yield, and at the same time increase the fertility of their soil. In calling attention to these things, and to prove to our farmers, who are backward, that good seed corn is worth while, and is a paramount factor in the production of corn, your association is worth all it costs. You may not be getting dollars ahead yourselves in giving attention to this Association; but after all, is there not some satisfaction in knowing

that you are one of the leaders, one of the progressives in your community? If you are doing this thing and doing it earnestly, with all your might, perhaps without your knowing it, perhaps unconsciously to yourselves, you have taken hold of the four corners of your community and are lifting it up.

I have a lot of respect for men who do things without the hope or fear of reward. So many men like to hold office. They like to blow a horn. Only a few men are willing to get down and pull the loads and bear the burdens and lift up when there is not much glory and publicity about it. The real men and women of today, the real bone and sinew of this country of ours are the men and women who are willing to do these things just for the good there is in doing them. Eugene Field has a happy thought:

"For Life is a mirror of king and slave;
It is just what we are and do.
Then give to the world the best you have
And the best will come back to you."

That is a splendid sentiment; it is the sentiment that thrills your heart and your being. If the corn crop should fail us for one year I fear we could not describe the conditions which would exist. Corn is more of a staple than ever. Twenty-five years ago corn was considered good to feed our cattle and our hogs, our horses, our live stock and perhaps a few of those human beings who lived in log houses. If you had gone to New York City twenty-five years ago and to one of the great hotels and asked for a bowl of mush and milk they would have said "that is a hay seed with moss on his back sure;" today you find it one of the luxuries. A year ago I was in the city of Boston and in one of the great hotels of that city. On that bill of fare was this item: "Mush and milk 50 cents." That is not excursion or homeseekers' rates by any means. Corn cakes and maple syrup, 40 cents; corn bread, 20 cents. Corn is king. Thousands and thousands of carloads go into the city to become cereal foods and to play a prominent part on the menu card of our great hotels. The United States produces two-thirds of the corn crop of the world. At the great corn exposition at Omaha the ears, if laid side by side, would have reached more than three miles. Over eighty dishes of good things to eat, all made of corn, were there. Corn is playing a wonderful part in our every day life. It is worth while to improve the crop. Improve the seed and increase the yield.

The man who won the prize for the champion ear of corn at Omaha had been ten years in growing that corn. The crop and the seed will respond to intelligent culture just the same as a human being will respond to care, culture and environment. It is worth

while to improve the seed. One time a young man went to a college president and asked him for a recommendation. The young man told him how he had gone through school, how apt he was, that in six months he had done wonders and completed a course. The old college president looked at him and said: "Yes, when God wants a pumpkin he can get it in six months; but when he wants an oak it takes a hundred years." When you want the best seed corn you have got to put in time, it takes years. You have commenced this work. I want to offer all encouragement I can to keep at it. Put on your armor. Make the fight a good one. With our population increasing and our crop yield decreasing it is absolutely necessary that the enlightened public spirited farmers of this land keep at the work so as to be able to raise more corn on the acre in 1910 than they raised in 1909.

We have our experiment stations and agricultural colleges doing a splendid work. I one time heard Senator Doliver pay a splendid tribute to Mr. Holden, the corn king of Iowa. He has added thousands and thousands of bushels of grain to that state and has put thousands and thousands of dollars into the pockets of Iowa farmers which would not have gone there had it not been for the work of Holden. We have a corn king here in Ohio who has no peer in Iowa or in any other state. I sometimes wonder whether we fully appreciate the splendid work that is being done by Mr. Williams. These men are kings without crowns. These are the kind of kings we like to shake hands with. I do not know what his salary is, I do not know what is the salary of our friend Goddard, I do not know what is the salary of the field men working at the Experiment Station. I do not know what the salary is of the men at the University, but I do know they are worth more than they get. I know that every soldier in the standing army costs this country $1500 a year. I know and you know that these men in this work, the field men who go out and help you in your corn growing tests, are worth a thousand times more to the public welfare of the great state of Ohio than that soldier in the Phillipine Islands, standing guard while the big corporations and trusts are making millions out of the natural resources out of those oriental islands. (Applause). Mr. Brown in his speech in New York called attention to the great increase in the army and navy, of the two great battleships for which they would appropriate money at this session of Congress. He said the cost of these two battleships would put two farms of 640 acres each and build an experiment station on each farm and equip each station, two of these great institutions, not only in one state but in every state of this union. I want to ask you my good friends whether it is not more to our purpose

and to our great cause of agriculture that we would have the experiment stations than the battleship? The armor plate trust wants to sell the armor plate at more than four or five times the cost. (Applause). I do not know what these men are paid; but if Mr. Lloyd, Mr. Abbott, Mr, Shoesmith and Mr. Goddard are paid $1500 a year, do you know that the cost of these battleships would pay the salary of one of these men in every county of Ohio not only for one year but for the next two hundred years. That is what these two battleships would do if our congressmen had sense enough to vote that way. I have written letters to find out something about our expenditures at Washington. The United States Commissioner of Education writes me that for the year 1907 the amount of money spent for war purposes amounted to 58 1-2 percent, for education 3 1-2 percent; and then the commissioner says that for that year the educational appropriations were much larger than usual because of five million appropriation given to the new state of Oklahoma. How much of agriculture? 1 4-5 percent, that is all. Senator Burton and Congressman Towner from Minnesota furnished the figures that in 1908 the percent for war purposes was about 67 percent. That means that every time the government spends three dollars for any purpose whatever two go for war, and one lonely dollar is left to improve our waterways, build public buildings, for agriculture, for education, for salaries, etc. Do you believe that is a good thing? Aren't you working and toiling in a better cause than in this cause of war? That means 3 percent for education—it won't average that for 1908, and 67 percent for war, that means every time the government spends a dollar for education it spends 22 for war. Less than 2 percent for agriculture. That means every time this country spends one dollar for agricultural encouragement, 37 go for war purposes. I want to submit to you, is it good business sense? You know and I know that we should not spend 37 times as much money to shoot brains out as we do to shoot brains in.

Not long ago in one of the Chicago papers appeared this notice: "Wanted. a man with a wooden leg to mash potatoes in a restaurant, at good wages." When I found out about some of these things I wondered if it would not be better business if some of our senators and congressmen were mashing potatoes in a restaurant, than down there voting 37 dollars to fight while only voting one dollar to feed the nation. One time little Johnny said: "We are going to have a wooden wedding at our house." When asked to explain he said: "Well, sister is going to marry a blockhead; that's why we call it a wooden wedding." Don't you know that the farmer would start

something if he knew all the things that are going on at this time; he would conclude that while we were doing so much to improve the breed of corn it was also time to improve the breed of congressmen at Washington.

I am glad to say a word of encouragement. I want to commend you in the highest terms. You ought to shake the hands of your officers. You ought to congratulate and encourage them for what they have done in their efforts to get this association started in Ohio. These things do not come without great labor. Somebody must stay up nights, somebody must have a lot of patience. We must increase the yield. When we improve the seed, when we improve the plant, when we improve the soil, we also improve the race of human beings, and our citizenship. Put on your armor and make the fight a good one. Thanks, Health, Success.

THEORIES AND PRACTICE IN CORN GROWING

By E. G. MONTGOMERY, Nebraska Experiment Station

All human progress must be founded on the discovery of truth. In the last 50 years we have seen marvelous improvements along almost every line of industrial endeavor, but has it occurred to many of us how this has been possible, while during a period of a thousand years the world made little or no advancement. This was impressed upon me yesterday as I came east from Lincoln, Neb.

About seventy years ago my relatives moved west from Wayne County, Ohio, and at that time used what was about the best means of travel at hand. They used the heavy ox cart and slow oxen for transporting freight, while the saddle horse was considered the fastest and best means of travel over land. A trip from central Ohio to Nebraska at that time took three to four months, traveling at the rate of about twelve miles per day. Yesterday, however, I stepped into an upholstered pullman car at Lincoln, had dinner in a dining car where almost any dish could be ordered from fruits of California to the sea food of the Atlantic Coast, slept comfortably, and today arrived in Ohio in less than twenty-four hours.

Our grandfathers had as good means of travel as their Pilgrim fathers. In fact, during the 300 years there had been little improvement in means of travel. They had no better means of travel than was in vogue 2000 years before, when the Romans had the saddle horse and the ox cart and could travel practically as fast. For 2000 years there was no progress in methods of travel, then in a period of 50 to 75 years we have suddenly progressed from ox carts and saddle horses to pullman trains, automobiles and flying machines.

Has it occurred to you why this progress was not possible in the past. The reason surely was not because men 2000 years ago lacked ambition, for surely the men conducting some of the great wars, building some of the great cities and empires were ambitious enough. The thing, however, which made the invention impossible, for example, of a steam engine, was the lack of facts regarding the making of steam, and the mechanical principles. These facts, however, were discovered one at a time. The principle of steam was discovered by one experimentor who was not searching after a steam engine, but only after truth. One physical or mechanical principle after another was discovered by this or that searcher after truth, and finally after all the facts had been discovered it only remained for some inventor to put the known facts together and make the steam engine. If one of these principles had been overlooked, it would not have been possible to have made the steam

engine run until it was discovered. In other words, all progress depends first on the discovery of facts, and second on application. In a majority of cases the man who first discovered the facts had little or no notion of how they might be applied and so I make the general statement, that every discovery of truth, no matter how impractical it may seem today, will very likely sooner or later have a practical application, and I will also make a general statement to the effect that progress is impossible until facts and principles have been discovered. There is a great difference between fact and theory. All of us are filled with theories about things, but theories about flying machines wont make a heavier than air apparatus fly. It is only when the actual principles governing the flying machine are discovered and put in practice, that the effort to fly will be successful, lacking one of these, and it would be a failure.

The above statement also applies to progress in agriculture. For example, having theories about how things should be planted, or how the seed should be selected, do not affect the results one way or the other. It is only when the actual facts of the case have been worked out that we can expect results, and until these facts have been worked out we cannot hope for the same marvelous progress in agriculture that we have seen in transportation during the past 50 years. I have very often seen two men argue about what type of corn was the best seed corn, when neither man had ever tested out his theory, or ever expected to, but yet they both would contend by the hour that they knew what was best and were following their untested theory. I may say also that even agricultural college men have been guilty of handing out theories about things when they had little or no reliable facts to substantiate their own theories. It is time we ascertain the actual facts regarding the selection and handling of seed corn and cease indulging in unproven theories.

The data which I am about to present must be considered more of a report of progress on corn experiments rather than conclusive evidence. It will still take many years of careful investigation to prove the points at issue, and probably after this work has been carried out we will discover that there is no such thing as a one best type of ear or type of corn for all regions, but that each section must have a type especially adapted to its conditions.

PHYSICAL CHARACTERS OF THE CORN PLANT TO BE REGARDED IN SELECTION

Every practical corn man will recognize the difficulty of laying down any fixed rules regarding characters of the plant to be considered in selection, since corn must be grown under a great variety

of conditions, and rules which would apply in one case may be found inapplicable in another. The following report is to be considered rather as a statement of progress than as conclusive statements on the physical characters of the plant considered.

Shape of Ear.—Regarding this character, note the following quotation from Wallaces' Farmer under date of Feb. 17, 1909.

"Highest Yield from Smooth Ear."

"Eugene D. Funk at the Illinois Agricultural College short course gave an object lesson with fourteen samples of corn that goes farther than any other known evidence to prove a new thing about the increase of yield. He said the corn growers some years ago had arbitrarily selected what they considered an ideal ear of corn, but that there was absolutely nothing to prove that it was the best producing ear. Mr. Funk secured the Coolidge strain of Leaming corn from Knox county and Chester strain of Leaming from Champaign, and from each strain he picked out seven different types of kernel and ear. He has bred these types separately for seven years. Type No. 1 is a rough ear close to the ideal of the Association, while No. 7 was the smooth corn which the corn growers have been trying to get away from. He was surprised to find that for six years out of seven in one strain and for five years out of seven in the other the comparatively smooth type of corn had produced the highest yield of all. He finds that the rough corn gets looser on the cob and is far later in maturing."

Also Prof. C. G. Williams of the Ohio Experiment Station presented a paper before the Nebraska Corn Improvers' Association in 1908 in which he made this statement: "Ears a little above average length for a variety and locality have yielded more bushels of corn per acre than ears falling below average length, while ears of large circumference have proven lower yielders than those of medium circumference, showing that it is impossible to make up a deficiency in weight due to shortage in length by increased circumference."

At the Nebraska Experiment Station in 1904 a lot of rather long smooth ears were selected from a lot of pure Reid's Yellow Dent. From this plat the largest ears of a smooth type were again selected and this has been continued since. During the five years' selection the type has changed in quite a marked degree, as is shown by the illustrations and data. During the past four years the long smooth types have been planted in the variety test beside the regular selection of Reid's Yellow Dent. For three years, 1905-06-07, we used for comparison seed grown here at the Station and from the same original stock from which selection was made, but this was discontinued, and in 1908 we used seed secured from a grower in western Iowa. Results have been as follows:

TABLE IV.—LONG SMOOTH COMPARED WITH ORDINARY MEDIUM-ROUGH TYPE OF REID'S YELLOW DENT. (YIELD ESTIMATED ON AIR-DRY WEIGHT FEBRUARY 1.)

Year	Smooth type		Standard type	
	Bushels per acre	Per cent shrinkage	Bushels per acre	Per cent shrinkage
1905	69.7	6.9	59.4	9.4
1906	47.2	10.0	51.4	7.5
1907	69.9	8.2	64.1	11.7
1908	56.8	15.0	51.2	14.0
Average	60.9	10.0	56.5	10.6

The following data were taken on the 1908 crop:

Type	Average weight of ear	Average length of ear	Average circumference of ear	Length of 100 grains end to end	Average per cent grains
	Ounces	Inches	Inches	Inches	
Smooth type	8.8	8.3	6.1	50	86
Standard type	9.0	7.6	6.5	54	85

It is not at all plain why the long smooth type has outyielded the standard type. The shrinkage from husking time to February 1 has averaged about the same. The percentage of grain is almost the same. While the depth of grain has become less on the smooth type, the size of cob has also reduced some.

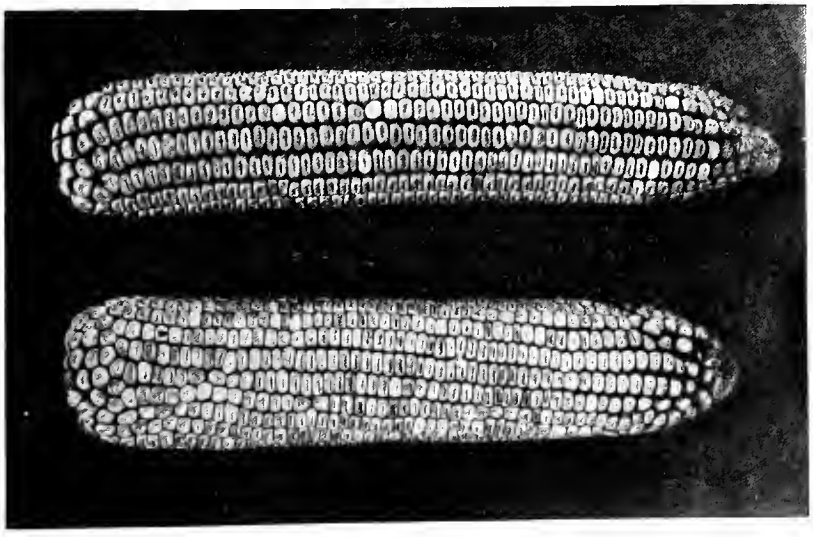


Fig. 6 Typical specimens of the rather long smooth type of Reid's Yellow Dent after five years' selection, and the standard type.

So far as this evidence goes, it indicates that our present ideal type is not long enough in proportion to circumference for best yielders. It might also be said that a large ear of slender type will mature farther north than one of greater circumference. It is possible to do considerable damage in the northern half of the corn belt by encouraging farmers to grow deep-grained corn with too large an ear circumference.

The foregoing remarks relate to the relation of shape of ear to yield.

Size of Ear.—Size of ear has been the one most important consideration in choosing seed ears with most corn growers.

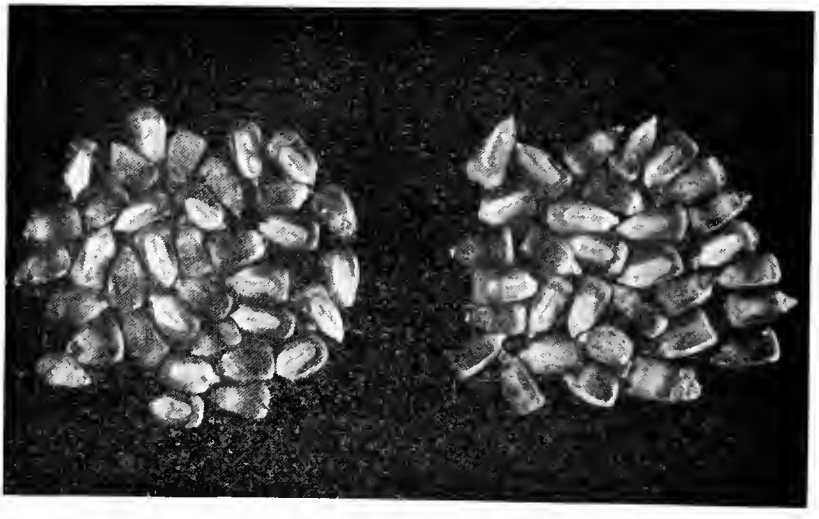


Fig. 7. Grain of smooth and standard type of Reid's Yellow Dent after five years' selection.

If all ears in a field grew under identical conditions of soil and moisture, then size of ear would be a fair way of judging comparative yielding power. We are coming to recognize, however, that when an ear is large simply because the plant upon which it grew had twice its share of space and sunshine, this particular ear, even though large, may have no special merit as a seed ear. In fact, an ear grown under crowded, adverse conditions but only half as large may be a better producer. A 12-ounce ear produced where most of the ears around it weigh only 8 ounces is a more valuable seed ear than a 16-ounce ear produced under conditions where the average ear weighs 16 ounces. It will be shown later in this report (p. 90) where we have secured better yields from rather small ears grown under adverse conditions than from large ears grown under favorable conditions.

Taking up for a moment the comparison of large and small eared varieties it will be found that large eared varieties are seldom the highest yielders. In a test of 19 varieties at the Nebraska Experiment Station it was found that the five highest yielders were not the largest eared strains, but on the contrary the average weight of ear for these varieties was considerably below the average weight of ear for all the varieties.* Similar results have been secured in the South at the Georgia Experiment Station.†

In 1906, 204 individual ears were planted out in our ear to row test plat. Each seed ear was weighed before planting, the average weight varying from about 10 to 17 ounces. One half of each ear was planted in 1906 and the remaining portion in 1907. In neither year could a relation be discovered between the weight of the original seed ears and the yield. Also the average weight of ear of the entire progeny of these 204 ears was taken for both years. The following table shows that we have very little relation between the yield of these rows and the size of ear.

TABLE V.—SHOWING RELATION OF YIELD AND SIZE OF EAR ON 200 EAR-TO-ROW PLATS FOR TWO YEARS (1906-1907).

1906				1907			
Class (yield per acre)	No. plats in class	Yield per acre	Av. wt. of ear	Class (yield per acre)	No. plats in class	Yield per acre	Av. wt. of ear
Bushels		Bushels	Ounces	Bushels		Bushels	Ounces
85+	12	89.5	9.12	80+	5	81.9	9.76
80-85	18	82.0	8.96	75-80	16	76.6	9.92
75-80	27	77 3	9.28	70-75	46	71.7	9.76
70-75	39	72.5	9.12	65-70	62	67.4	9.60
65-70	42	67.0	9.28	60-65	49	62.6	9.44
60-65	33	62.7	9.28	55-60	19	57.5	9.60
60-	29	54.6	9.28	55-	6	47.2	8.80

Table VI shows the distribution of ears of different sizes in the various classes in 1906. For example, in the first class there was 3 per cent of 10-ounce ears, 27 per cent of 9-ounce ears, etc. There is no larger per cent of heavy ears in good yielders than in the poorer. Similar results were secured in 1907.

TABLE VI.—CLASSIFICATION OF 204 EAR TO ROW PLATS INTO SEVEN CLASSES ACCORDING TO YIELD AND SIZE OF EAR IN EACH CLASS, IN PER CENT.

Yield per acre	Per cent of 10-ounce ears	Per cent of 9-ounce ears	Per cent of 8-ounce ears	Per cent of 7-ounce ears	Per cent of 6-ounce ears	Per cent of 5-ounce ears	Per cent of 4-ounce ears
Bushels							
85+	3	27	27	22	11	5	5
80-85	5	27	26	20	13	5	5
75-80	5	28	25	21	12	5	4
70-75	4	26	24	22	13	7	4
65-70	5	26	24	22	13	7	4
60-65	6	29	25	19	11	7	
60-	6	23	24	21	16	7	4

* Nebr. Bul. 91, p. 12. † Ga. Bul. 69, p. 191,

Data were taken on some 40 characters of the plants in each plat for two years to find out if possible just what characters of the plant, if any, were related to yield per acre. It may be stated in brief that the high yielding rows produced a greater number of ears per plat, due (1) to a less number of barren plants, (2) to a larger number of 2-eared plants, but, most of all, (3) to the large number of tillers bearing ears.

We would not be justified in drawing general conclusions from data at hand, and can only say that at present there seems no reason to believe extra large ears to be more valuable than medium-sized ears for seed purposes.

Shape of Kernel.—Regarding this there is very little to say from an experimental point of view. If we finally modify our opinion regarding the ideal shape of ear, naturally we must change in some degree our ideal shape of kernel. At least it may be said that at present we have several very good varieties of corn with only an average depth of kernel. General experience in the West and North is that corn with medium or shallow grains will ripen more sound corn under adverse conditions, such as drouth or cool weather, than deep-grained strains. On the other hand it may be true that under very favorable conditions deep-grained corns are capable of greater yield. Prof. Williams also stated two years ago at our Nebraska meeting that mother ears with 82.7 per cent corn had on the average yielded more shelled corn per acre than the ears ranking highest, 86.7 per cent. The data presented on "Shape of Ear" (see page 82) also bear on this point.

Height of Ear.—We have arranged the data for two years on the 204 ear to row plats above referred to, in such a way as to show relation of yield to height of ear. Also data on several hundred individual plants were arranged in a similar manner. Our final conclusion was that the height of ear on the stalk bore no relation to yield.

For the past five years, selection has been carried on at the Illinois Station with Leaming corn to produce a high ear type and low ear type.* The principal results are shown in Table VII.

TABLE VII.—FIVE YEARS' SELECTION FOR HIGH AND LOW EARS.
(ILLINOIS EXPERIMENT STATION)

Year	Height of ear		Difference in average height of ear	Difference in average height of plant	Yield high-ear strain	Yield low-ear strain
	High-ear plat	Low-ear plat				
	Inches	Inches	Inches	Inches	Bushels	Bushels
1903	56.4	42.8	13.6	11.4	.....	.....
1904	50.3	38.3	12.0	8.8	.....	.....
1905	63.3	41.6	21.7	21.9	.....	.....
1906	56.6	25.5	31.1	30.3	72.4	72 6
1907	72.4	33.2	39.2	30.7	64.5	68.8
1908	57.3	23.1	34.2	34.7	60.9	59.5

*Ill. Bul. 132

No marked difference in yield has been found so far, but a marked change in size of plant and time of maturity, the low-eared plant being smaller and the corn maturing earlier.

Since early maturity is a matter of importance through the north half of the corn belt in order to secure sound corn, and since the selecting of low ears seems to give early maturity without decreasing yield, it seems desirable to select low ears. Also in the West where we are troubled with drouth we are coming to believe that a small stalk will withstand drouth better than a large stalk.

Size of Stalk.—We have taken considerable data on size of stalk in individual plants. In an average field of corn the heavy stalks will weigh about four times as much for a given height as the more slender ones. The yield of grain seems to increase with thickness or weight of stalk up to a little above average, but the very heaviest stalks do not yield quite as well as those of average or somewhat above average weight.

Amount of Leaf.—The amount of leaf a plant should have is a difficult question to determine.

Table VIII shows the relation of leaf area to dry weight in about 120 individual plants measured. This shows that for a given leaf area of 1200 square inches certain plants have twice the weight of others.

TABLE VIII.—SUMMARY OF 120 PLANTS ACCORDING TO RELATIVE WEIGHT OF DRY MATTER. ARRANGED IN GROUPS OF TEN, BEGINNING WITH THE HIGHEST. ALL DATA RECALCULATED AS THOUGH EACH PLANT HAD 1200 SQUARE INCHES LEAF AREA.

No. of group	Weight of stalk	Weight of ear	Total weight	Square inches of leaf area per gram of dry weight
	Grams	Grams	Grams	
1	323.8	369.1	692.9	1.732
2	307.0	308.1	615.1	1.951
3	250 0	316.0	566.0	2.120
4	226.4	298.2	524.6	2.287
5	223.9	276.0	499.9	2.400
6	212.2	269.7	481.9	2.490
7	224.2	233.4	457.6	2.622
8	187.1	252.5	439.6	2.730
9	189 3	223.4	412.7	2.908
10	192.2	206.0	398.2	3.014
11	161.4	207.7	369.1	3.251
12	138 5	192.3	330.8	3.627

Also in the 204 ear to row plats referred to before in this paper, we weighed the leaves from a portion of each plat. Results are as follows:

TABLE IX.—SUMMARY OF 204 EAR TO ROW PLATS TO SHOW RELATION OF LEAF TO YIELD.

Class (weight of leaves)	Number plats in class	Average weight of leaves per stalk	Yield per acre	Height of stalk	Ratio of weight of stalk to total weight of stalk and ear
Grams		Grams	Bushels	Inches	
40-	11	36	66.4	113	.321
40-45	30	43	69.6	109	.398
45-50	42	47	69.3	110	.422
50-55	50	51	70.4	112	.457
55-60	32	56	71.1	111	.517
60-65	19	62	68.8	111	.555
65+	19	73	68.2	111	.656

So far as our investigations have gone we have not been able to find a relation between leafiness of plants or strains and their productive capacity. If this is true, then leafiness is a character we might disregard, so long as the plant is productive. Other investigations also show that very leafy plants use more water than plants with small leaves, so it seems that in dry regions we should select productive plants with small leaves. On the other hand, in very humid regions a large water loss by the plant would possibly not be a disadvantage.

Tillers, or Suckers.—Most varieties of corn produce tillers abundantly under favorable conditions. At the Nebraska Station we have practiced removing the tillers or suckers from a series of plats to compare with similar plats with the tillers left on. Removing the tillers has never failed to decrease the yield. (See Table XIV).

In all of our ear to row work, a record has been kept regarding tillers. The best yielding rows always have a good percentage of *ear-bearing tillers*. The poor yielding rows may have as many tillers but they seem to be smaller, and few are ear bearing. In fact, tillers usually develope in response to the needs of the plant. If the stand is thin they thicken it up and increase the yield. If the stand is thick they make only a small development, and do no harm. It is doubtful whether we shall find many cases where it would pay to remove tillers.

Barren Plants. These are produced by various unfavorable conditions. A small percent are produced naturally even under favorable conditions. In all our breeding work we have found those rows having a high percentage of barren stalks to be low in yield, though the barrenness seems to be due mostly to other causes than inheritance. (See Table X).

TABLE X: SUMMARY OF 204 EAR TO ROW PLATS ARRANGED IN SIX GROUPS ACCORDING TO PERCENTAGE OF BARREN PLANTS (1906)

Barren plants	Yield per acre	Percent stand
Percent	Bushels	
1.6	75.70	75.
3.5	74.76	76.
5.5	69.29	74.
7.5	67.21	74.
10.8	65.20	71.
19.7	65.9	74.

SUMMARY

Characters of the seed corn plant to be considered as affecting yield and quality:

Shape of Ear. Evidence seems to indicate a rather long type of ear to be best.

Size of Ear. This depends on environment and is only of importance when it is known under what conditions the plant was grown.

Shape of Kernel. Medium depth to be preferred under average conditions.

Height of Ear. Low ears give as good yield and mature earlier.

Size of Stalk. Large or small stalks do not yield as well as stalks just above medium in size.

Amount of Leaf. Does not seem to be related to yield,

Tillers. Strains capable of producing *ear-bearing* tillers when occasion demands yield best. In soils where corn does not tiller this might be reversed.

Barren Plants. Decrease yield.

TRANSMISSION OF PLANT CHARACTERS

As explained before, when the 204 ears were planted in 1906 only one-half of the ear was planted, and another plat was planted from each ear the following year. To see whether the crop from these ears exhibited the same characteristics the second year, the plats were arranged in such a way as to give a direct comparison. In most cases some degree of transmission was shown both years, though in a few cases it was not apparent.

TABLE XI: SHOWING TRANSMISSION OF CHARACTERS, 204 EAR TO ROW PLATS ARRANGED IN CLASSES IN EACH CASE

Ears per plat		Tillers per plat		Barren plants Percent	
1906	1907	1906	1907	1906	1907
249	193	73	40	1.6	5.6
218	186	100	48	3.5	4 5
195	186	118	48	5.5	4.5
180	177	137	52	7.5	4.2
161	166	157	72	10.8	6.5
139	162	181	83	19.7	5.0

THICK AND THIN PLANTING FOR GROWING SEED CORN

It is a general custom among seedmen to plant their corn intended for seed rather thin, in order to develop large ears. This, however, does away to some extent with natural selection. For example, we find when planting corn at the rate of 1 plant per hill, 3 feet 8 inches apart, that about 25 good ears weighing 12 ounces or more are produced to every 100 plants. When 3 plants per hill are planted, only about 10 good ears are produced on 100 plants, and when we have five plants per hill, only about five 12-ounce ears are produced to 100 plants. It seems that a plant which, when planted as thickly as five plants per hill, is capable of producing a good ear must be unusually vigorous. When planted thin, however, it is not possible to tell which of the good ears produced would have been good if the stalks had been planted thick. Again in thin planting, we have only a small number of barren plants, usually less than two percent, but the thick planting averages about 11 percent barren plants. In other words, in thick planting, natural selection determines which plants have the natural vigor to produce when conditions are somewhat adverse. To secure data regarding this, an experiment was started in 1905. Corn was grown at three rates, namely, 1, 3 and 5 plants per hill. Good ears were selected from all three plats, In 1905 seed from each plat was planted at all three rates. We have selected seed continuously from each rate since 1905. The following table summarizes results to date.

TABLE XII: SUMMARY OF YIELDS FROM DIFFERENT RATES OF PLANTING FOR THREE YEARS (1906-07-08) ACCORDING TO ORIGIN OF SEED

Conditions under which seed was grown	1906 yield	1907 yield	1908 yield	Average yield
	Bus.	Bus.	Bus	Bus.
One plant per hill	64.5	65.3	55.6	61.8
Three plants per hill	66.0	66.1	54.6	62.2
Five plants per hill	70.3	67.1	55.8	64.4

The average yield for the three years shows a decided advantage in favor of selecting seed from the thicker planting, although the difference has grown less each year. The experiment must be continued some years, before final conclusions can be drawn.

RATES OF PLANTING CORN

In Bulletin No. 91 of the Nebraska Station are given results with various rates of planting corn for the years 1903-1904. The experiments have been continued up to date and in most cases confirm results reported in Bulletin 91. For these experiments the variety used has been Hogue's Yellow Dent, the hills being 3 feet 8 inches apart each way.

TABLE XIII: AVERAGE RESULTS FROM PLANTING CORN AT VARIOUS RATES FOR SIX YEARS (1903-1908)

Plants per hill	Yield per acre	Average weight of ear	No. ears per 100 plants	No. tillers per 100 plants	*Two-eared plants per 100	Barren plants per 100	Yield of stover per acre
	Bus.	Ozs.					Lbs.
1	43.8	10.5	141	138	13.3	3.	....
2	67.7	10.6	115	60	4.9	4.8	5984
3	75.5	9.4	95	25	2.4	6.9	5972
4	76.7	8.2	82	10	.8	8.3	6692
5	76.3	7.4	77	3	1.1	10.8	6969

* Four years only.

NOTE: There is an apparent discrepancy between number of barren stalks and number of ears per 100 plants (columns 4 and 7). This is due to the fact that a certain number of plants in the thick plantings die and entirely disappear between first count, July 10, and maturity when barren stalks are counted.

Yield of grain has averaged about the same for 3, 4 or 5 grains per hill. As rate of planting increased, the size of ear has decreased, as shown by column 3, while the number of barren plants increased as shown by column 7. Two stalks per hill produced about 90 percent as much corn as 3 stalks. This was due to the increased size of ears and the large number of tillers producing ears as shown by column 4. Also 1 stalk per hill produced 64 percent as much grain as 3 stalks per hill, due principally to the large number of tillers bearing ears, the average results showing 161 ears for every 100 plants.

It is evident from these experiments covering a period of six years that under the conditions here at the Station about three stalks per hill may be regarded as a full stand. If more than this is planted the ears decrease in size and the number of barren stalks increase. With less plants than 3 per hill the plant attempt to adjust itself to the conditions by producing a larger ear, and the production of more ears by tillers.

The average yield has been about 75 bushels per acre, and under such conditions a stand of 3 to 4 stalks per hill will probably give the maximum crop. Under 50-bushel conditions, however, the stand should be thinner. Recent results published by the Illinois Experiment Station* obtained on a number of soils indicate clearly that the poorer the soil the thinner the stand should be.

The yield of stover increases with the rate of planting; hence, if corn is grown for this purpose it should be planted thickly.

THE ECONOMIC VALUE OF TILLERS

In Bulletin 91 of the Nebraska Station it is shown that for the years 1903 and 1904 rows of corn where tillers were left on gave an average yield of 81 bushels per acre, while rows where they were removed yielded only 64 bushels. For the past three years the experiment has been continued but the corn planted at various rates. Following is a summary of results. The variety used was Hogue's Yellow Dent, with hills 3 feet 8 inches apart each way.

* Ill. Exp. Sta. Bul. No. 126,

TABLE XIV: EFFECT OF REMOVING TILLERS ON YIELD OF GRAIN (1906-1908), YIELD IN BUSHELS PER ACRE

Number plants per hill	1906			1907		
	Tillers on	Tillers removed	Difference in favor of tillers	Tillers on	Tillers removed	Difference in favor of tillers
One	44.2	30.5	13.7	47.7	33.1	14.6
Two	72.3	56 2	16.1	70.7	57.5	13.2
Three	70.7	57.8	12.9	74.2	68.8	5.4
Four	70.7	64.3	6.4	83.6	80.0	3.6
Five	77.1	71.0	6.1	83.6	79.4	4.2
	1908			Average		
One	40.3	....	....	45.9	31.8	14.0
Two	55.3	55.5	.2	66.1	56.4	9.7
Three	64.0	66.7	2.7	69.6	64.4	5.2
Four	65.4	70.1	4.7	73.2	71.4	1.8
Five	69.4	67.3	2.1	76.7	72.6	4.1

TABLE XV: EFFECT OF REMOVING TILLERS ON YIELD OF STOVER FOR THREE YEARS (1905-07-08)

Number plants per hill	Yield per acre with tillers on	Yield per acre with tillers removed	Increase per acre due to tillers	Percentage of decrease in total stover due to removing tillers
	Pounds	Pounds	Pounds	Percentage
One	5061	2208	2853	56 3
Two	5127	4200	927	18.8
Three	5115	4687	428	8.3
Four	5801	5602	199	3.4
Five	6043	5987	56	.9

A decreased yield is shown as a result of removing the tillers even with a stand of four or five stalks per hill. It is possible that on poor soils or in a series of very dry years different results might be secured. However, with fair conditions for producing corn it appears that removing tillers would result in an actual decreased yield.

Removing tillers has had a tendency also to increase the number of 2-ear stalks and decrease the number of barren plants, although this benefit has not apparently been enough to counteract loss of ears ordinarily produced by the tillers.

TABLE XVI: EFFECT OF REMOVING TILLERS ON THE NUMBER OF TWO-EARED PLANTS AND BARREN PLANTS, TWO YEARS (1907-1908)

Number plants per hill	2-eared plants per 100		Barren plants per 100	
	Tillers on	Tillers removed	Tillers on	Tillers removed
One	18.8	28.5	1.15	.50
Two	8.9	13.3	3.60	1.30
Three	4.4	4.7	2.70	1.13
Four	1.6	1.7	2.95	2.18

The remarkable way in which the corn plant adjusts itself to conditions by developing tillers to thicken up the stand when it is thin is further illustrated by the way these tillers will disappear in large numbers when not needed. For example, we have found the maximum numbers of tillers are to be found about July 10th, when the plants are three to four feet high. However, from this time on they will disappear in large numbers if they are not needed. When the plant begins to develop tassel and ears, evidently the nourishment is diverted in this direction, as the tillers appear to perish from this time on.

TABLE XVII: SHOWING DISAPPEARANCE OF TILLERS FROM JULY 10 TO OCTOBER 1, FOR THREE YEARS (1905-06-07)

TILLERS PER 100 PLANTS

Plants per hill	1905			1906		
	July 10	Oct. 1	Decrease	July 10	Oct. 1	Decrease
One	146	197	+49*	216	177	—39
Two	106	97	— 9	105	77	—28
Three	86	45	—41	49	27	—22
Four	73	16	—57	31	10	—21
Five	57	3	—54	12	0	—12
	1907			Average		
One	242	162	—80	201	178	—23
Two	104	58	—46	105	77	—28
Three	54	20	—34	63	31	—32
Four	28	3	—25	44	9	—35
Five	12	0	—12	27	1	—26

* Increase.

TABLE XVIII, SHOWING VARIATION IN NUMBER OF TILLERS PRODUCED BY DIFFERENT VARIETIES FOR TWO YEARS (1907-1908)

Variety	Maximum number of tillers		Minimum number of tillers	
	Rate planting	No. tillers per 100 plants	Rate planting	No. tillers per 100 plants
Mammoth White Pearl	1	170.1	5.	8.4
Pride of North	1	132.0	4.3	8.6
Leaming (from Nebraska)	1	105.7	4.5	7.4
Leaming (from Illinois)	1	91.0	4.5	2.7
Calico	1	58.3	5.	3.9

VARIATION IN TILLERING

Different varieties show a marked difference in tendency to tiller. For two years five varieties have been planted from one to five grains per hill. Table XVIII shows rate of tillering when maximum number were produced. Under the same conditions some varieties produce two or three times as many tillers as others.

UNIFORM DISTRIBUTION OF THE SEED IN PLANTING COMPARED WITH A VARIED DISTRIBUTION.

In 1907 an experiment was planned to test the value of distributing the seed at a uniform rate of 3 grains per hill as compared with distributing the seed in different amounts per hill, but planting

the same number of grains per acre. The object of this experiment was to see whether in planting corn it would be necessary to have an absolute uniform drop of 3 grains per hill, or whether a reasonable variation would affect the yield. The first plat was planted uniformly 3 grains per hill, in the second plat we alternated 2 and 4 grains per hill, the third plat was alternate 1 and 5 grains per hill and the fourth plat was alternate 1, 3, and 5 grains per hill. All plats were hand planted, the desired number of grains dropped in each case, just as would be done by a machine. Hills 3 feet 8 inches apart each way, and variety used was Hogue's Yellow Dent. Plats were duplicated each year and check plats placed on both sides of each series.

TABLE XIX.—DISTRIBUTING SEED IN PLANTING IN VARIOUS WAYS, AND EFFECT ON YIELD.

Grains planted per hill	Yield per acre		
	1907	1908	Average
	Bushels	Bushels	Bushels
3	71.2	58.9	65.5
2 and 4	70.4	56.9	63.6
1 and 5	64.5	60.6	62.6
1, 3, and 5	70.7	60.1	65.4

A uniform distribution of the seed gave slightly better results than an uneven distribution. The variation in kernels per hill is much greater than would result with a corn planter, even if dropping very unevenly. The data therefore indicate that ordinary variation in rate of dropping found in corn planters will have very little and probably no effect on the yield per acre.

EAR TO ROW CORN BREEDING

For the past ten years there has been a growing interest among farmers in seed corn selection and corn breeding work. While the Nebraska Experiment Station has been carrying on work for several years, no general report or recommendation has been made up to date.

The following is a report on two general tests of ear to row breeding work by different methods and also plans for conducting a breeding plat. The first was started in 1903 (Class I) and is still continued. The second test was started in 1906 (Class II). The two tests will hereafter be referred to by the year in which they were started. The first is a method of continuous selection, the second a method for isolating the best yielding strains from a large number.

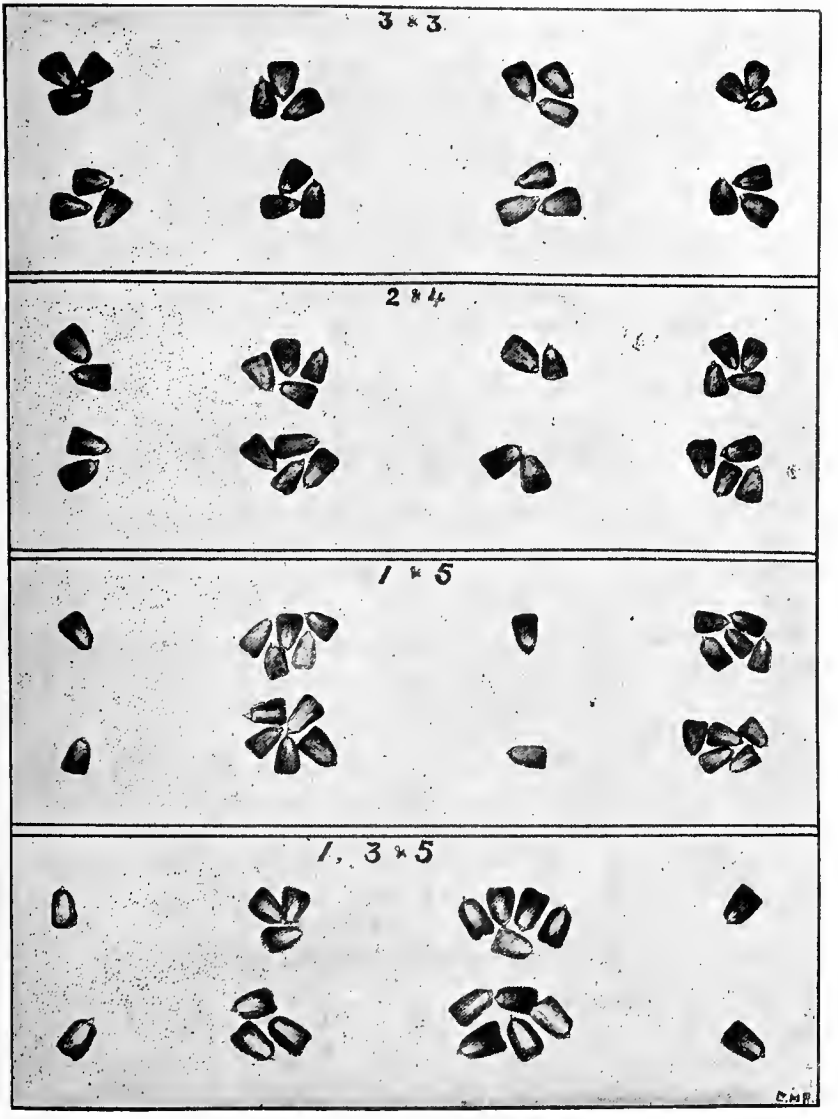


Fig. 11 Showing plan of distributing seed in plats where different methods were discussed.

HISTORY OF THE 1903 STOCK (CLASS I)

Method Used.—Seventy-nine ears of Hogue's Yellow Dent were planted in 1903 and 22 more added in 1904, making 101 ears as foundation stalk. The plan was to shell all the grain from each ear, and plant each in a separate row, then harvest and weigh the grain from each row, selecting a few of the heaviest yielders, and discarding the rest. Of course, due precautions have been taken to secure a uniform stand and accurate comparative weights. From the best yielding rows, a few ears, usually six, were selected to be planted by the same method a second year. For example, from the first 79 ear-rows planted in 1903, 17 rows were selected that had yielded more than 90 bushels per acre. From each of the 17 rows 6 ears were selected. Each of these six ears was planted to a row the second year, but so distributed that no two ears from the *same* mother row came near together. All the rows tracing back to an original mother plant are called a *family*. In harvesting the second year, the yield of each row was taken separately. Then the six rows from a *family* averaged together. If a family did not average up well all of its seed was dropped, even though one or two rows might have yielded well. For example, from the 17 families chosen in 1903, two were dropped in 1904, six in 1905, and three more in 1906, leaving six families which had stood the test for four years. No attempt was made to prevent intercrossing with the poorer families, as we wished to see what result could be obtained by this method of continuous selection.

Results of Test.—In 1907 we made a thorough test of the yield of these selected strains. Eleven rows from six of the best families in the 1906 crop were chosen. Six ears were chosen from each row. The six ears from each row were then planted in a 12 row plat, and on each side of this plat was put in a "check" plat planted with the same stock of corn from which this was originally selected, but which had been handled in the ordinary way. Therefore, the difference in yield would indicate the progress made. Table I gives the results.

TABLE I.—SUMMARY, COMPARING YIELD OF SELECTED STRAINS WITH ORIGINAL STOCK. (1907)

Plat No.	Family No. or check	Yield per acre	Av. of checks on either side	Difference between selected strains and checks	Seed corn yield per acre	Av. of checks on either side	Difference between selected strains and checks
		Bushels	Bushels		Bushels	Bushels	
2	check	64			12		
3-8	79	84	69	15	13.1	9.3	3.8
9	check	74			6.6		
10-15	73	74	71	3	11.1	6.3	4.8
16	check	68			6		
17-22	51	77	69	8	10.5	5.9	4.6
23	check	70			5.8		
24-29	51	79	70.5	8.5	8.2	7.2	1
30	check	71			8.7		
31-36	57	82	72	10	12.2	7.2	5
37	check	73			5.8		
38-43	73	82	74	8	10.2	5.5	4.7
44	check	75			5.3		
45-50	73	86	73.5	12.5	13.5	7.6	5.9
51	check	72			10		
52-57	57	79	73.5	5.5	10	7.6	2.4
58	check	75			5.3		
59-64	79	89	74	15	7	5.2	1.8
65	check	73			5.2		
66-71	7	83	74.5	8.5	8.2	5.2	3
72	check	76			5.3		
73-78	46	85	74.5	10.5	10.1	6.2	3.9
79	check	73			7.1		
							3.7
Average increase				9 5			

The summary shows that the selected strains yielded an average of 9 bushels per acre more than the original stock, and about one-half more seed. The improvement in uniformity of the ears was also very marked.

In 1908, plats were again planted from some of the best rows selected from the 1907 crop. A summary of the yield per acre for two years is as follows:

	1907	1908	Average
	Bushels	Bushels	Bushels
Selected strains	82	66	74
Checks (original)	72.5	59	65.7
Difference	9.5	7	8.3

HISTORY OF THE 1906 STOCK (CLASS II)

A second method of selection was started in 1906, according to a different plan, and has also given some interesting results.

Method Used.—Two hundred and four ears of the same variety as used in the "1903 stock" (Hogue's Yellow Dent) were taken and careful notes made in regard to each. About one-third of each ear was planted in a row 16 rods long. The remainder of the ear was kept. The yield per acre was found to vary approximately from 50 to 90 bushels per acre. However, not feeling satisfied that a single year's test was enough we decided to duplicate the entire experiment in 1907.

It seems that a certain year may favor a particular group of ears and cause them to yield well, while in another year it might be a different group of ears that will yield best. Also having some indication from the 1906 test which ears would yield high, we could watch these closely a second year and perhaps find some reasons for their ability to yield. Consequently the remnants of the 204 ears were taken and arranged in order according to yield in 1906. We then planted the ears in this order, the best yielder first and the poorest last.

Results for the two years did not correspond very closely. In Table II the data for two years are summarized, the plats being divided into groups of 20 for comparison.

TABLE II.—SUMMARY: PLATS ARRANGED IN GROUPS OF 18 TO SHOW COMPARATIVE YIELD OF SAME GROUP OF EARS ON TWO CONSECUTIVE YEARS (1906 AND 1907). ARRANGED ACCORDING TO YIELD IN 1906.

*No. of plats included in group—1907 arrangement	Yield per acre		Difference between 1906 and 1907	Yield of checks 1907	Difference between 1907 yield and checks
	1906	1907			
	Bushels	Bushels	Bushels	Bushels	Bushels
1-20	87.8	69.6	+18.2	64.2	+5.4
20-40	81.3	68.9	+12.5	64.1	+4.8
40-60	77.0	69.4	+ 7.6	62.4	+7.0
60-80	74.2	67.7	+ 6.5	64.4	+3.3
80-100	71.9	70.0	+ 1.9	64.5	+5.5
100-120	69.5	69.8	− .3	62.4	+7.4
Average	77.0	69.2		63.6	5.5
120-140	67.0	66.8	+ .2	66.2	+ .6
140-160	65.4	64.9	+ .5	64.9	0.0
160-180	63.6	67.6	− 4.0	62.8	+4.8
180-200	60.3	62.4	− 2.1	65.8	−3.4
200-227	53.8	60.7	− 6.9	67.5	−6.8
Average	62.0	64.5		65.4	.9
Grand average	70.1	67.0	+ 3.1	64.4	+2.6

*There are only 18 trial plats in a group, as three of the plats are checks. For example, in the second group, plats 20, 30, and 40 are check plats.

NOTE:—The average yield in 1906 was 3.1 bushels better than in 1907.

The lack of close relation between the two years is apparently due to two causes,—one being a certain amount of error in results that must be allowed for, due to lack of uniformity in soil; and the second, variation in season so that the same strains do not always seem to rank first in different seasons. We may divide the plats into two general groups having 108 ears in the first and 96 in the second, (not counting in check plats). Since the yield of the check was 1.8 bushels better in the second group than in the first, we should increase the yield of the first to make results comparable. This is done in the following summary.

YIELDS PER ACRE.

	1906 yield	1907 corrected yield	Check plats, corrected yield
	Bushels	Bushels	Bushels
First group 108 ears	77	71.0	65.4
Second group 96 ears	62	64.5	65.4
Difference	15	6.5	
Average	69.5	67.7	65.4

These data indicate that if we had taken the best half of the ears after the first year's test, they would have given an increased yield of about 3 bushels above the average. There were certain ears, however, that yielded well both seasons. Also notes regarding the quality of the crop and other characters of the plants indicated the general superiority of these ears.

Four of the best ears out of the 204 according to the two year's average were selected for further increase. As we still had some of the remnants of the original ears, these were planted; also the progeny of these ears grown in 1907; also, check plats were planted from the original unselected stock and plats from the remnants of the nine poorest ears. Results were as follows:

TABLE III.—COMPARATIVE YIELD OF SELECTED TYPES IN 1908. (CLASS II.)

	Bushels
Average yield of remnants, 4 best ears	70
Average yield of 1907 progeny, 4 best ears	68
Average yield of check plats (original stock)	59
Average yield of remnants, 9 poorest ears	56

The 1903 Class I Selections under same conditions yielded as follows (see Table I):

	Bushels
Average yield remnants, 5 best ears	73
Average yield 1907 progeny, 5 best ears	66
Average yield check plats	59

It seems that by the second method (1906 stock, Class II) as good results were secured in much less time and by a simpler method.

The progeny of the four best ears yielded 9 bushels per acre better than the checks, while the remnants of the original ears yielded 11 bushels better.

The method by which these results were obtained was simple and not expensive. Whether the selected strains will maintain their superiority without continued selection is not known, but presumably they will. We have an isolated plat of the best 4 ears and shall be able to report on this point later.

HOW TO CONDUCT A BREEDING PLAT

As there is considerable inquiry at present regarding methods of corn breeding, it seems best at this time to outline a plan which experience so far seems to recommend.

Variety To Use.—Select some variety well adapted to the region, and a good yielder. This is important, as one might spend years working on a poor variety and in the end have nothing better than the best variety already existing. It may be best to do some preliminary variety testing.

Selecting the Ears.—If yield is to be the principal object of selection, it will not be necessary to stick closely to some one type of ear. In fact, since we do not know definitely what particular type of ear in a variety may do best in a new locality, it would seem wise to select several types, the main consideration being that the ears are sound and well matured.

Number of Ears to Select as Foundation Stock.—Exceptionally good ears are not common, probably not more than one in every 50 to 100 ears. Therefore, if one starts with only a small number of ears, 25 to 50, he may not find a single exceptional yielder in the lot. Not less than 100, and better 200 ears, should be tried out in the preliminary trial.

The Test Plat.—Great care should be exercised in securing a uniform piece of land for the test plat, as everything depends on being able to compare in an accurate way the yields of the different ears. The land should not be exceptionally rich but only of the average fertility of the region. If the land can be plowed twice,—say fall plowed, then backset in the spring,—and disked several times, it will do much toward equalizing conditions.

Size of Plat.—One-half an ear will plant a row 16 to 20 rods in length. However, there will be less error if the rows are duplicated, and it is best to plant two rows 8 rods long from each ear. One hundred ears will make 200 plats 8 rods long. This will take a piece of land 32 by 11 rods or 16 by 22 rods; or two test plats one-half this size on different parts of the farm may be used, duplicating the experiment in each.

Check Plats.—No matter how carefully the land is selected, it may lack uniformity and for this reason "check plats" should be planted with a uniform lot of corn. We have found making every fifth plat a check very satisfactory. The simplest way is to make a check of every plat that is a multiple of 5; as, 5, 10, 15, etc.

Planting the Ears.—The land should first be laid off by a marker into checks 3 feet 8 inches apart. The planting must be done by hand. Carry the ear, and shell off the grains as needed.

It is best to plant 4 grains per hill; then when the corn is 6 inches high, thin down to 3. This will give a perfect stand. *Every precaution should be used to secure uniform conditions in each plat, or else the experiment would be a waste of time, as the results would not mean anything.*

Cultivation.—Ordinary cultivation, taking care that none of the rows are unduly injured.

Taking Notes.—Some breeders prefer to keep extensive descriptive notes for their own information, but for practical results very little note taking is necessary other than accurately to secure comparable yields. Of course, if the breeder is selecting for some particular quality, such as earliness, height of ear, angle of ear, etc; he must take notes on these points. Also taking a set of notes on each individual row furnishes the very best training possible in close observation; and as a man cannot know too much about the corn plant in order to be a successful breeder, it will usually pay him well to keep as complete a record as possible. Following is a set of the notes kept by the Experiment Station. The breeder can pick out such of these as seem best in his case.

NOTES ON ORIGINAL SEED EARS.

No. of ear	Weight of ear	Weight of grain	Weight of cob	Per cent of grain	Per cent of cob	Length of ear	Circum. of ear	Rough or smooth
	Ounces	Ounces	Ounces			Inches	Inches	

NOTES ON CROP FROM THESE EARS.

Date of planting	Germination	Date of tasseling	Height of stalk	Height of ear	Per cent suckers	Per cent barren stalks	Weight of leaves
	Per cent		Feet	Feet			Ounces

NOTES CONTINUED.

Weight of stalk	Yield per acre	No. ears per plat	Average wt. ears	Average length of ears	Ratio wt. ears to length	Per cent of grain	Indentation
Ounces	Bushels		Ounces	Inches			

Harvesting. When corn first ripens, it contains 25 to 30 percent water, but slowly dries out to about 15 percent. In the breeding plats some rows ripen and dry out sooner than others; hence, the weights will not be comparable until all are equally dry. For this reason we have found it best to leave the breeding plats in the field for six to eight weeks after ripening, or till about December 1. Any very late maturing or slow maturing rows should be noted and discarded at harvest, as we do not want a type that will not mature well.

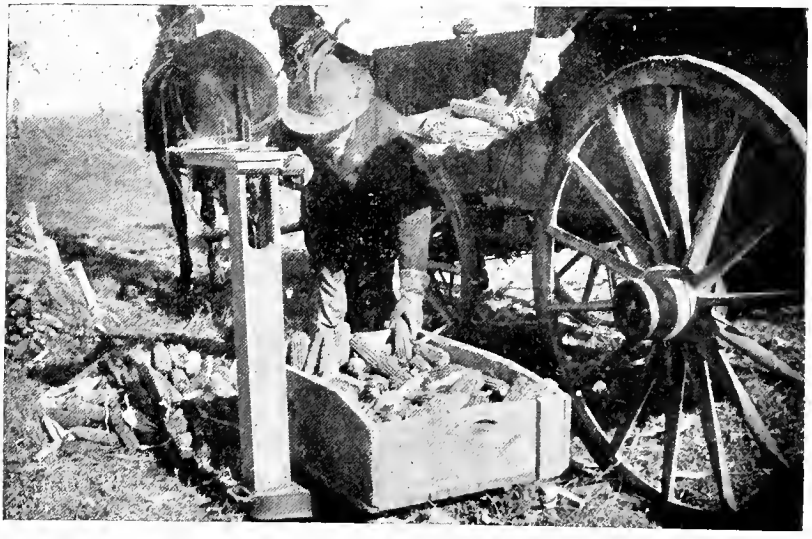


Fig. 1. Weighing a single row. The wagon is divided into two compartments, so two rows can be husked through at once. The corn is weighed at the rows, and dumped at the end of the row from which it was husked.

A very good method of harvesting the plats is to divide a wagon box into two or four compartments. Then husk a plat into each compartment. At the end of the rows have a platform scale with a box large enough to hold the corn from one plat. Scoop the corn into this box, and as each plat is weighed dump the corn at the end of the row, leaving the plat stake with each pile.

Leave the corn in these piles until all plats are husked, then mark the piles from high yielding rows. A careful examination can now be made of these piles to note whether any of the piles seem immature, low in vitality, or otherwise undesirable. About one-fourth of the best plats should be noted, that is, 20 to 25 out of 100.

From these, seed for the general crop may be selected for the next year.

The breeder still has one-half of the original ears from which the crop was grown. It is from these that he will build up his improved strains of corn.

The Second Year's Work. Having located the 20 or 25 best original ears, the remnants of these are again planted in separate rows the second year. The reason so large a number of the remnants are again planted is because the degree of error may be so large—due to the fact that one season may favor a certain type—that we cannot determine exactly, the first year, just which are the two or three best for all seasons. When the second year's results are secured we may decide which to choose on the basis of two years' record. The seed from these *two* or *three* best rows may now be used as foundation stock for a select strain of corn. We have given results in the first part of this bulletin with such seed. Where the original ears are large there will be quite a remnant left even after testing two years. The remnants of the very best may be put together the third year and a small plat started of this selected strain.

Fig. 2. The corn from two adjacent rows. Row 64 yielded 81.2 bushels per acre and row 65 yielded 58,7 bushels per acre

The Third Year's Work and After. The third year the breeder may increase his strains from the selected ears in as extensive a manner as possible.

The fourth year, if he desires to continue improvement, he could again make a selection from this increase plat and put out an ear-to-row test plat, repeating the first test. There is no experimental evidence to show how long improvement may be continued by this system, but it seems reasonable to expect new variations of higher

value to occur for at least a second generation. My belief is that if this ear-to-row breeding plat were put out once every four years, the producing capacity of the corn could be kept at a high standard.

Fig. 5 gives the general plan of arranging the breeding plats the first and second years. The length of line in the first year's test indicates the variation in yield to be expected from the different ears. In the second year's test about 20 percent of the best yielders are arranged according to yield, while the rest are discarded.

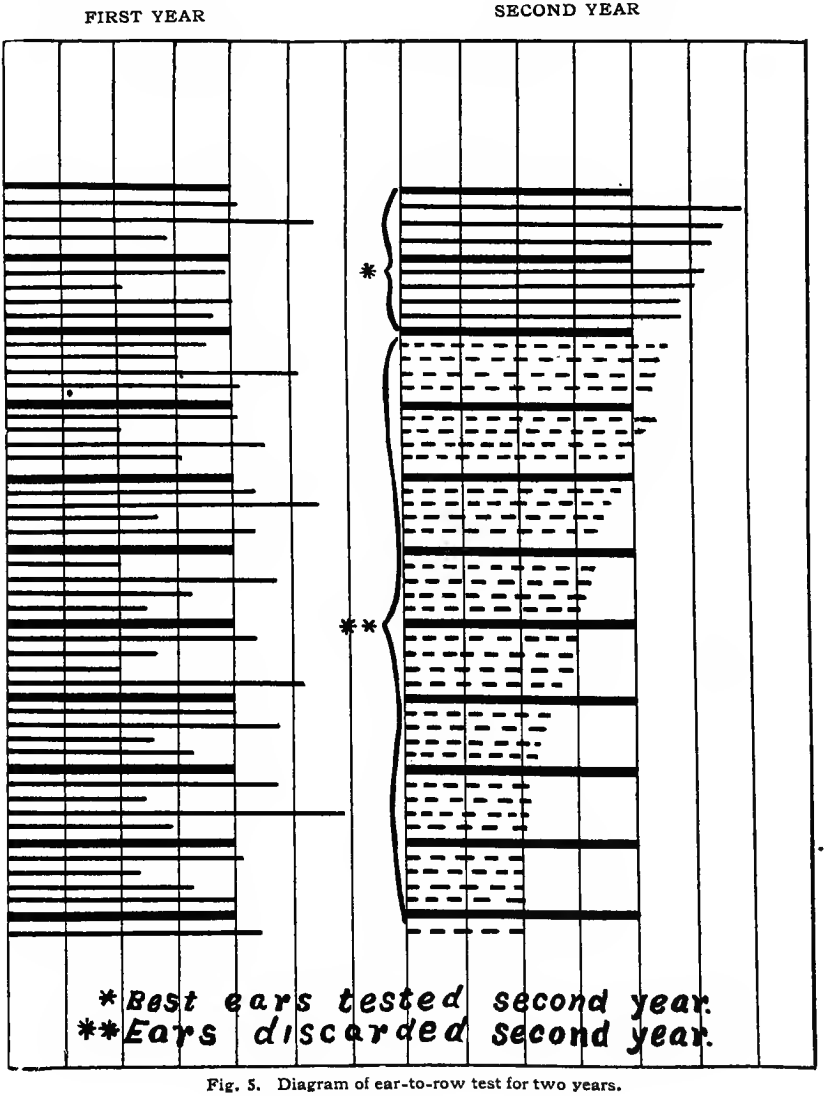


Fig. 5. Diagram of ear-to-row test for two years.

REPORT OF COMMITTEE ON INSTITUTES AND EXPOSITIONS

V. M. Shoesmith, O. S. U., Columbus
F. H. Owen, Marion L. P. Bailey, Tacoma
Howard McCune, Wilmington

We beg leave to make the following report of the Second Annual Corn Show held in Columbus, January 10-13, under the auspices of the Ohio Corn Improvement Association,

On account of the lack of suitable room at the State University, and because of the meetings of the allied associations, the Corn Show was held on the fourth floor of the new Lazarus Building, which provided ample space and an abundance of light.

The total number of exhibits exclusive of Class F, Sweepstakes, Class G, County Exhibits and Class O, Grange Exhibits, were 338, the distribution of which among the various classes was as follows:

Class A—10 ears yellow corn	128
Class B—10 ears white corn	46
Class C—10 ears any other variety	31
Class D—Best individual ear	73
Class E—Best 30 ears any variety	37
Class H—Yield per acre and cost of producing corn contest	3
Class L—Farm management contest	1
Class J—Uniformity of stand contest	1
Class K—Corn Breeding contest	1
Class L—Test of varieties	3
Class M—High School contest	10
Class N—Boys' corn growing contest	4
Total number of exhibitors representing 38 counties	177

A new feature which was added to the show this year was the germination test, in which 6 grains from practically every ear in the show were placed in a small paraffined paper cup filled with sand. The results of the tests in Classes A, B, C and E, together with the number of entries in these classes from respective counties are given in the following table:

NOTE: The results of the germination, Class E, have been reduced to 10 ear basis, so as to be comparable with regular 10 ear classes.

County	No. of entries	Average No. of ears showing perfect germination	Av. percent of germination of those ears not having perfect germination	Average vigor of sprouts
Athens	1	8	75	87
Belmont	1	7	66	80
Brown	1	10		100
Butler	8	8.8	75	90.7
Champaign	14	7	75	89.0
Clark	5	8	70	88
Clinton	14	8.2	73	89.4
Coshocton	2	8.5	78	85
Darke	4	7.9	83	88
Delaware	3	8.6	72	90
Fairfield	2	8.5	83	90
Fayette	20	7.0	75	85.7
Franklin	6	7.1	76	84
Gallia	17	8.7	82	97
Green	5	7.8	80	82
Highland	7	9.0	83	91.5
Holmes	4	9.2	60	92.2
Knox	12	8	83	91
Licking	20	8.4	80	92.5
Logan	1	9	66	80
Madison	2	6.5	80	92.5
Marion	7	7.5	62	84.3
Mercer	1	9.0	83	90
Montgomery	3	7.8	72	89
Morrow	9	8.5	80	97.4
Paulding	17	8.4	80	92
Perry	1	8	83	100
Pickaway	6	7.8	66	85
Preble	1	8	83	97
Putnam	4	7	76	83.5
Ross	8	9	70	90
Van Wert	6	8.5	83	87
Warren	1	10		100
Wayne	2	8.5	83	90
Wyandot	1	7	83	83
Average		8.2	76.3	89.2

The list of awards in several classes were as follows:

CLASS A, 10 EARS YELLOW

Award	Entry No.	Name and address	County
1st	39	Tasso Terrell, New Vienna	Clinton
2nd	115	Frank Baker, Greenville	Darke
3rd	10	H. W. Bussert, Bloomingburg	Fayette
4th	3	Ray R. Fultz, Jeffersonville	"
5th	170	Tracy & Graves, Antwerp	Paulding
6th	165	T. J. Forman, Payne	"
7th	124	G. O. Vannorsdall, Jeffersonville	Fayette
8th	263	O. A. Dobbins, Cedarville	Greene
9th	154	Mell Parrott, Mt. Gilead	Morrow
10th	169	C. H. Allen, Paulding	Paulding
11th	172	J. T. Miller, "	"
12th	242	Cary George, Okeana	Butler
13th	282	W. C. Hall, Newark	Licking
14th	37	J. C. Creamer, Jeffersonville	Fayette
15th	166	Ed Delaet, Paulding	Paulding
16th	107	Ira Baker, Greenville	Darke
17th	43	R. O. Evans, Venedocia	Van Wert
18th	163	J. T. Morrisy, Paulding	Paulding
19th	122	O. O. Zehring, Germantown	Montgomery
20th	69	George Brackney, Wilmington	Clinton
21st	76	J. T. Bennett, "	"
22nd	315	I. S. Cook Jr., Chillicothe	Ross
23rd	94	W. A. Starbuck, Wilmington	Clinton
24th	128	Albert Vannorsdall, Jeffersonville	Fayette
25th	133	J. A. Flax, Jeffersonville	"
26th	262	Ed Lambert, Grove City	Franklin
27th	104	Howard McCune, Wilmington	Clinton
28th	280	Clint McKinney, Vanatta	Licking
29th	291	James Reid, Newark	"
30th	87	F. L. West, Bloomingburg	Fayette

CLASS B, 10 EARS WHITE

1st	38	Tasso Terrell, New Vienna	Clinton
2nd	223	F. W. Cline, Bloomingburg	Fayette
3rd	226	J. A. Morris, "	"
4th	58	Jas. C. Foster, Higby	Ross
5th	229	Glen Hinton, Woodstock	Champaign
6th	49	J. W. Wingfield, Springfield	Clark
7th	46	H. E. Pugh, Venedocia	VanWert
8th	227	M. E. Hinton, Woodstock	Champaign
9th	55	H. D. Hodge, Mechanicsburg	"
10th	205	Byron L. Staley, Woodstock	"
11th	278	Edgar McKinney, Vanatta	Licking
12th	299	Clint McKinney, "	"
13th	150	Mell Parrott, Mt. Gilead	Morrow
14th	196	M. L. Gaver, Mechanicsburg	Champaign
15th	276	John Watkins' Newark	Licking
16th	159	Lloyd Elliot, Mt. Gilead	Morrow
17th	248	L. T. Shaner, Circleville	Pickaway
18th	326	W. F. Keppler & Co., Oxford	Butler
19th	127	Albert Vannorsdall, Jeffersonville	Fayette
20th	41	J. M. Strothers, Venedocia	VanWert

CLASS C, 10 EARS OTHER THAN YELLOW OR WHITE

1st	64	Roy B. Fultz, South Solon	Fayette
2nd	134	J. A. Flax, Jeffersonville	"
3rd	160	Lloyd Elliot, Mt. Gilead	Morrow
4th	132	Matthias Flax, Jeffersonville	Fayette
5th	22	J. O. Ferneau, South Salem	Ross
6th	5	Chas, Coleman, Lyndon	"
7th	136	G. W. Scott, Lancaster	Fairfield
8th	219	J. H. Smith, Xenia	Greene
9th	283	Edgar McKinney, Vanatta	Licking
10th	100	C. N. Price, Radnor	Delaware
11th	206	B. F. Williams, Jeffersonville	Fayette
12th	9	H. L. Bumgardner. Mechanicsburg	Champaign
13th	53	A. L. Campbell, Cardington	Morrow
14th	54	H. D. Hodge, Mechanicsburg	Champaign
15th	182	Jacob W. Willett, Hillsboro	Highland

CLASS D, INDIVIDUAL EAR

1st	152	Mell Parrot, Mt. Gilead	Morrow
2nd	40	Tasso Terrell, New Vienna	Clinton
3rd	96	W. A. Starbuck, Wilmington	"
4th	44	R. O. Evans, Venedocia	VanWert
5th	180	Roscoe Straley, Jeffersonville.	Fayette
6th	131	Matthias Flax, "	"
7th	224	F. W. Cline, Bloomingburg	Greene
8th	264	O. A. Dobbins, Cedarville	Morrow
9th	153	Mell Parrott, Mt. Gilead	Fayette
10th	26	A. B. Creamer, Jeffersonville	

CLASS E, 30 EARS ANY COLOR

1st	255	F. W. Cline, Bloomingburg	Fayette
2nd	109	Ira Baker, Greenville	Darke
3rd	117	Frank Baker, "	"
4th	249	L. T. Shaner, Circleville	Pickaway
5th	118	C. Tracy, Antwerp	Paulding
6th	197	M. L. Gaver, Mechanicsburg	Champaign
7th	123	O. O. Zehring, Germantown	Montgomery
8th	178	Roscoe Straley, Jeffersonville	Fayette
9th	187	John W. Brackney, Wilmington	Clinton
10th	208	E. D. Straley, Jeffersonville	Fayette
11th	234	Byron L. Staley, Woodstock	Champaign

CLASS E, 30 EARS ANY COLOR. Concluded

12th	120	Tracy & Graves, Antwerp	Paulding
13th	61	T. H. Orcutt, London	Madison
14th	325	W. F. Keppler & Co,, Oxford	Butler
15th	129	Albert Vannorsdall, Jeffersonville	Fayette

CLASS F, SWEEPSTAKES

1st	Tasso Terrell, New Vienna	Clinton
2nd	" " "	"
3rd	Frank Baker, Greenville	Darke

CLASS G, COUNTY EXHIBIT

1st	Licking County
2nd	Fayette County
3rd	Clinton County

CLASS H, YIELD PER ACRE AND COST OF PRODUCING CORN CONTEST

1st	John Cunningham, Gambier	Knox
2nd	Howard McCune, Wilmington	Clinton
3rd	Byron L. Staley, Woodstock	Champaign

CLASS I, FARM MANAGEMENT CONTEST

1st	Glen C. McIlroy, Irwin	Union

CLASS J. UNIFORMITY IN STAND CONTEST

1st	235	B. F. Hawley, Woodstock	Champaign

CLASS K, CORN BREEDING CONTEST

1st	James W. Cook, Forest	Hancock

CLASS L, CONTEST IN TESTING VARIETIES OF CORN

1st	Wm. H. Sears, Barnesville	Belmont
2nd	T. E. Votaw, South Salem	Columbiana

CLASS M, HIGH SCHOOL CONTEST

1st	New Holland High School, New Holland	Pickaway

CLASS N, BOYS' CORN GROWING CONTEST

1st	Byron L. Staley, Woodstock	Champaign

CLASS O, GRANGE CONTEST

1st	Sunrise Grange No. 1550

FINANCES

While the number of exhibits and the attendance at the Show was not as great as the committee had hoped, the average quality of the exhibits was much above that of last year and it is believed that much good resulted from the Show, The committee feels its keenest disappointment in the small response received in the various field contests, the farm management contest, the high school contest and the grange contest, which were designed to awaken a wider interest in the work of the association and the improvement of the

yield and quality of corn in Ohio. It is felt that in order for the Show to be a permanent success it must be supported by an educational and altruistic spirit rather than a show and gambling spirit. The State Corn Show in Ohio is now in its infancy, and it depends upon the members of the Association in the various counties of the state to say if the Show shall be continued and, if so, along what lines. This committee feels that there is a great future for the Show, and that it may do an unlimited amount of good in the agriculture of the state if the corn growers of the state will give this work their loyal support.

The committee solicited financial aid from all of the local associations of the state. This was done to secure necessary funds for making the Corn Show a success and also because we believed it desirable for the members of the association to feel that the Show was their own with a measure of responsibility for its success. Five local associations made contributions to this fund as shown in the financial statement of this report. Several other associations indicated their interest in the matter, but were unable to raise any funds for carrying on the work.

If the Show is to be continued, definite sources of income should be provided for carrying on the work, and it is believed that if this comes from the local associations, either through an increase of the membership fee for this purpose, or as voluntary subscriptions, it will contribute more largely to a successful Show than contributions received from interests which receive little or no direct benefit from the Show.

FINANCIAL STATEMENT

RECEIPTS

Cash on hand from last year	*$ 47.85
From entry fees	76.35
From auction of corn	232.50
From Grain Dealers' Association	150.00
From Executive Committee of State Association	100.00
From Licking County Corn Association	20.00
From Butler County Corn Association	15.00
From Clinton County Corn Association	15.00
From Hardin County Corn Association	10.00
From Lake County Corn Association	10.00
From L. H. Goddard	10.00
Total	$686.70

*See explanation on page 110.

DISBURSEMENTS

For premiums at State Corn Show	$443.75
To V. M. Shoesmith for sundries	24.41
To Capitol Printing & Engraving Co	8.00
To F. H. Owen for postage	2.00
To F. H. Owen for printing letters	.75
To Bucher Engraving & Printing Co	2.00
To Standard Cap & Seal Co	32.00
To F. H. Owen, expense attending corn meetings	25.00
To Cherington Printing & Engraving Co., diplomas	25.00
To V. M. Shoesmith for sundries	1.60
To Howard McCune for services of auctioneer	8.95
To A. G. McCall, drayage	4.00
To A. G. McCall for having cups engraved	1.50
Total	$578.96
Total income	$686.70
Total expenditure	578.96
Balance	$107.74

*From the balance reported in 1908 Annual the following expenditures were made on account of the First Annual Show:

To D. M. Weaver, expense attending corn meetings	$16.00
To McArthur Mohler & Co.	8.00
To Capitol Printing Co	4.00
To W. J. Norris, engraving	4.50
To O. S. U. Domestic Science Department	6.39
Balance reported above	47.85
Balance reported in 1908 Annual	$86.74

State of Ohio, Marion County, ss.

Frank H. Owen being first duly sworn deposes and says that the account or statement hereto attached and marked "Exhibit A" and made a part of this affidavit, contains a full statement of all receipts and disbursements during the last year by the Committee on Institutes and Expositions of the Ohio Corn Improvement Association to the best of his knowledge and belief, further this deponent saith not.

Signed, FRANK H. OWEN.

Sworn to before me by the said Frank H. Owen and by him subscribed to in my presence this 16th dayof April, A. D. 1910.

Signed, FRED L. CARHART,

[SEAL] Notary Public, Marion Co., Ohio.

RECOMMENDATION TO THE EXECUTIVE COMMITTEE ADOPTED AT A MEETING HELD IN COLUMBUS, FEBRUARY 1, 1910

We believe the State and County Corn Shows bave accomplished much good in educating the farmers of the State regarding the selection of seed and cultivation of corn, but that the work thus far

is practically in its infancy and that the future opens up a field where great good may be accomplished. Therefore, we urge the Executive Committee of the State Association to enter into the work for another year with renewed vigor.

We recommend that special effort be made to promote field contests and that the premiums in these classes be arranged for the coming season and announced at the earliest possible moment. The farmers of the State should be led to realize the importance of uniformity of stand, of quality of corn, of yield per acre and records of cost of production.

As the National Corn Show will probably be held in Ohio next year we wish to appeal to the pride of the farmers of Ohio to make an extra effort to place Ohio's exhibit first in importance at the next Corn Exposition.

Respectfully submitted,
V. M. Shoesmith,
L. P. Bailey,
Howard McCune,
F. H. Owen.

Resolutions of regret regarding Chairman Shoesmith's leaving Ohio.

RESOLVED, that we, as membes of the Committee on Institutes and Expositions of the Ohio Corn Improvement Association, wish to commend the untiring energy and judgment of Professor V. M. Shoesmith as Chairman of this Committee, and to express much regret that the farming interests of the State and the College of Agriculture of the Ohio State University are so soon to lose his valuable services as an agricultural educator and worker.

(Signed) L. P. Bailey,
Howard McCune,
F. H. Owen.

REPORT OF SECRETARY

The past year has been a busy and useful one for the Ohio Corn Improvement Association. We believe that without question more corn shows and corn meetings have been held, that more field test work has been taken up and that more Ohio people have given serious thought to the improvement of their corn crop than in any previous year. This is evidenced to a certain extent by the healthy growth in membership which has been maintained by the Association. It was to have been expected that when the novelty wore off many associations would lapse their membership in the State Association. We observe, however, that whereas last year's Annual showed 2324 members in 57 associations in 53 counties, there are at this writing, according to the following pages, 3249 members in 85 associations in 62 counties; that while some of the old associations do not appear in the new list and several of those in this new list are not active at this writing, yet there are almost a thousand more active members than last year and more than twenty additional active associations.

It may as well be set down as a fact that unless an association is organized to do something of real benefit to the people, and perseveres in that purpose, it had best never have made the start. While the State Association would of course like to have each local association affiliate with all the other local associations in the larger State Association, believing, as it does, that by so doing much better work can be accomplished, yet it would much prefer that they do not thus affiliate unless by so doing they are stimulated to greater work on their own part. The sole purpose of the State Association is to help Ohio farmers, especially with their corn crop.

Of the multitude of problems, any one of which might be taken up to good advantage by any of the associations, the best single piece of work considered thus far seems to be the county corn variety test. In these tests the best local varieties and a few outside varieties are being grown side by side on large test plots under the supervision of the local association and the State Experiment Station. Last year fourteen counties took up this work. This year forty counties with 93 tests are working at it with much more definiteness of purpose than characterized the work last year. Last year, variations in yield, ranging from 10 to 25 bushels per acre, were secured in such tests. Fully as great variations may be expected this year. Since the varieties that are used in these tests include only those that are presumably best in the county, it is manifest that after the best of these are determined and introduced at the end of the next few years, a marked effect on the yield and uniformity of corn must be secured by the counties at work.

The associations being so inclined, it would seem well that all of them try to center their attention quite largely on their variety test work. By thus concentrating the attention of the entire State on this question much greater results may be accomplished within a limited time. Having done this, the Association can then with advantage take up at a later date some of the other equally important questions in a similar manner.

A number of the associations conducting these corn variety tests have, at the earnest request of the Executive Committee, saved the unshelled part-ear remnants of each of the samples used in the test. At the conclusion of the test these remnants may be matched up with the yields secured in the test and become a great object lesson in the judging of corn. The time surely has come when Ohio farmers should consider in judging corn nothing but yield of merchantable shelled corn per acre. A number of these part-ear remnants will be exhibited in the big Corn Improvement Association tent at the coming State Fair in order that those interested may look them over and make a guess if they wish as to the rank the samples will take when the yields have been determined this fall.

It may be well to note that a number of Associations include more than corn in their work. On our rolls we now have Corn and Fruit, Corn and Tobacco, and Corn and Potato associations. The State Corn Association is not in the least jealous of work along lines other than corn. Indeed, it is very anxious to help farmers in connection with any work they are doing. The only thing it asks is that the associations shall actually work hard in behalf of corn. Nothing can take the place of hard work in accomplishing results.

L. H. GODDARD, State Secretary.

Wooster, Ohio, June 7, 1910.

OHIO CORN IMPROVEMENT ASSOCIATION

Presidents and Secretaries of Local Associations

ASSOCIATION	PRESIDENT	ADDRESS	SECRETARY	ADDRESS
Allen (Richland tp.)	W. H. Radebaugh	Bluffton	Reese H. Huber	Bluffton
Ashland	E. L. Hostettler	Jeromeville	C. P. Funk	Jeromeville
Ashland (Nova)	G. Roy Crumrine	Nova	A. B. Richards	Nova
Athens	G. L. Fleming	Amesville	W. R. Goddard	Amesville
Athens (Coolville)	S. S. Humphrey	Coolville	H. P. Dutton	Hockingport
Auglaize	Clarence Lathrop	Hume	T. E. Bowsher	Wapakoneta
Belmont	F. L. Young	St. Clairsville	Ellis Bundy	Barnesville
Belmont (Lloydsville)	H. W. Hawthorne	Belmont	L. E. Bramhall	Belmont
Brown	Nevin Chapman	Georgetown	Wm. F. Bach	Georgetown
Butler	L. P. Clawson	Hamilton	C. L. Young	Collinsville
Butler (Morgan tp.)	Geo. Jeffries	Okeana	H. C. George	Okeana
Carroll (Brown tp.)	W. S. Moses	Malvern	Marion E. Foltz	Osnaburg
Clark	Al. T. Garlough	Springfield	E. W. Stewart	Springfield
			Upland	
Clermont	R. S. DeWitt	New Richmond	C. C. Barkley	New Richmond
			Lowland	
			H. G. Donaldson	New Richmond

Association	President	Address	Secretary	Address
Clinton (Wayne, Wilson, Richland tps.)	W. H. Cole	Sabina	Fred Gallaher	Sabina
Clinton	J. F. Bennet	Wilmington	Howard McCune	Wilmington
Columbiana	Dillwyn Stratton	Winona	C. S. French	Salem
Darke	E. M. Beuchley	Greenville	Frank Plessinger	Greenville
Darke (Arcanum)	Frank Bliss	Arcanum	Ralph M. Slonaker	Greenville
Darke (Ansonia)	David Hansbarger	Ansonia	Earl Hostetter	Ansonia
" (Wabash Valley)	W. A. Roll	New Weston	J. E. Birt	New Weston
Delaware (Sunbury)	F. C. Murphy	Sunbury	Chas. Fredericks	Sunbury
Erie (Eastern)	A. J. Nickols	Berlin Heights	W. H. Moats	Berlin Heights
Fairfield	J. M. Brunner	Carroll	G. W. Scott	Lancaster
Fairfield (Liberty tp.)	T. H. Kumler	Baltimore	Israel M. Blauser	Baltimore
Franklin (Farmers)	C. A. Stevenson	Canal Winchester	D. G. Boyer	Carroll
Franklin (Pleasant and Jackson tp.)	R. E. Turner	Grove City	Geo. B. Borror	Grove City
Fulton			D. W. Williams	Wauseon
Gallia	Dale McCormick	McCormick	E. R. McCormick	McCormick
Greene	W. M. Hardman	Yellow Springs	A. E. Collins	Xenia
Greene (Bath tp.)	G. W. Warner, Jr.	Harshman	Carl King	Harshman
Guernsey (Antrim)	J. A. Bond	Winterset	F. B. Downerd	Freeport
Hamilton (Anderson)	Samuel Edwards	Newton	C. Bart Chapman	Madisonville
Hancock	J. M. Reed	Findlay	A. E. Kerns	Findlay
Hardin	Elmer B. Steiner	Kenton	W. D. Wagner	Kenton
Hardin (Forest)	W. F. Switzer	Forest	Ed. Weir	Forest
	Corresponding Secretary		Jas. W. Cook	Forest
Harrison (Corn, fruit)	A. W. Sampson	Scio	W. J. Smith	Scio
Henry	P. Z. Blue	Hamler	A. F. Tabler	Napoleon
Holmes	J. G. Bilderback	Millersburg	Jno. F. Myers	Millersburg
Huron	Earl Burdue	Collins	F. W. Liles	Collins
Jefferson	C. W. McCullough	Steubenville	P. B. Floyd	Steubenville
Knox	Wm. L. Bottenfield	Centerburg	Jno. Cunningham	Gambier
Lake	N. C. Frost	West Mentor	A. M. Thompson	Perry
Licking	W. C. Hall	Newark	T. E. Adams	Newark
Logan	E. F. Miller	Bellfontaine	Walter Jackson	Bellefontaine
Logan (Belle Center)	Ward Swetland	Belle Center	I. B. Johnston	Belle Center
Madison	T. Hollon Orcutt	London	E. D. Orebaugh	London
Marion	M. M. Behner	Marion	F. H. Owen	Marion
Marion (Western)	R. M. Imbody	Larue	A. W. Jones	Larue
Meigs	G. V. Lasher	Rutland	G. E. Carson	Middleport
Mercer	S. K. Copeland	Celina	G. S. Nuding	Mendon
Montgomery	O. O. Zehring	Germantown	O. L. Shank	Germantown
" (Wayne tp.)	H. S. Neff	Osborn	Wm. H. Kendig	Dayton
Montgomery & Miami (Stillwater Valley)	P. F. Bolinger	West Milton	N. W. Rinehart	Union
Morrow	H. C. Bennet	Cardington	Horatio Markley	Mt. Gilead
Muskingum			Victor Herron	Chandlersville
Noble (Jackson tp.)	W. E. Smith	Lowell	J. A. Wagner	Dexter City
Noble, Guernsey, Muskingum	J. C. Reed	Renrock	J. H. Knight	Cumberland
Ottawa	John F. Gregg	Genoa	C. F. Coleman	Genoa
Paulding	C. H. Allen	Paulding	Elmer Jameson	Haviland
Perry	Jno. L. Holcombe	Sayre	A. C. Maris	Sayre
Pickaway	J. W. Hedges	Duvall	Jas. Swearinger	Circleville
Preble	C. B. Williams	Eldorado	A. J. Murray	New Paris
Preble (Twin Valley)	J. E. Schlotterbeck	Lewisburg	R. E. Bunger	Lewisburg
Putnam	J. A. Hummon	Leipsic	W. H. Tobias	Gilboa
Putnam (Continental)	S. F. Dickey	Wisterman	H. L. Hersh	Continental
Putnam (Kalida)	Jno. F. Clevenger	Columbus Grove	C. A. Burkhart	Ft. Jennings
Ross	Isaac S. Cook, Jr.	Chillicothe	Howard Boggs	Kingston
Sandusky	F. C. Snyder	Fremont	E. W. Roush	Lindsey
Seneca	Dan Egbert	Tiffin	R. H. Crum	Tiffin
Stark	H. N. Firestone	Middlebranch	Clayton Holl	New Berlin

Association	President	Address	Secretary	Address
Summit	W. E. Bradley	Kent	Maurice Betts	Cuyahoga Falls
Trumbull	D. H. Richards	Hubbard	S. N. Kerr	Hubbard
Trumbull (South)	D. W. Bordner	Warren	Chas. F. Kreitler	Warren
Tuscarawas	P. C. Knisely	New Philadelphia	H. S. Barties	New Philadelphia
Union (York tp.)	J. F. Tilton	Richwood	J. S. McGinnis	Richwood
Van Wert	R. O. Evans	Venedocia	W. S. Giffin	Van Wert
Van Wert (Venedocia)	J. M. Strother	Venedocia	J. Mills Richards	Venedocia
Warren	J. Merrill Bone	Lebanon	Albert Cowan	Lebanon
Washington	W. F. Lybrand	Fleming	S. W. Harvey	Fleming
Wayne	F. I. Heim	Wooster	D. F. Gresser	Wooster
Williams (Corn, grain and livestock)	Robert Ogle	Montpelier	H. B. Dargitz	Montpelier
Williams (Edon)	Will Kohlenbarger	Edon	C. H. Brosius	Edon
Wood	Wm. H. Hannah	Tontogany	G. C. Housekeeper	Bowling Green
Wyandot	J. L. Curlis	Sycamore	D. A. Bloom	Sycamore

OHIO CORN IMPROVEMENT ASSOCIATION

Statement of Membership and Dues Paid

Association	Members 1909 First Quarter	1909 Second Quarter	1909 Third Quarter	1909 Fourth Quarter	1910 First Quarter	**Over-paid 1908	Paid 1909	Over-paid 1909	***Paid 1910
1 Allen (Richland tp.)					(24)				
2 Ashland	39	39	39	39	29		3.90		2.90
3 Ashland (Nova)	(14)	*14	*14	*14			1.30	.25	
4 Athens	30	30	30	(30)			3.00		
5 Athens (Coolville)				(26)	31		2.60	2.60	.50
6 Auglaize	49					1.32			
7 Belmont	62	62	62	75	50	—.03	6.56		1.25
8 Belmont (Lloydsville)					24	(Organized June, 1910)			
9 Brown				(31)	31		3.10	3.10	
10 Butler	64	66	80	50	60		6.50		4.65
11 Butler (Morgan tp.)				(60)					
12 Carroll (Brown tp.)					(10)				
13 Clark					(65)				
14 Clermont									
15 Clinton (Wayne, Wilson and Richland tps.)	43	50	50	50	52		4.86	.03	1.22
16 Clinton	58	58	58	58			5.80		
17 Columbiana	94	131	135	140	158	.60	12.51		3.95
18 Darke									
19 Darke (Arcanum)					(62)				
20 Darke (Ansonia)					(10)				
21 Darke (Wabash Valley									
22 Delaware (Sunbury)	34	34					1.70		
23 Erie (Eastern)	(26)	26	26	26	31		2.60	.65	1.55
24 Fairfield	(103)	105	105	105	69		10.50	2.64	6.90
25 Fairfield (Liberty tp.)					10				
26 Franklin (Farmers)		67	67	67	70		6.71		1.75
27 Franklin (Pleasant and Jackson tps.)	39	*39	*39	*39		.28	4.10	.48	
28 Fulton					(37)				
29 Gallia	51	51	51	60	*60	2.55	7.70	4.92	
30 Greene	90	90	90	110	*110	—1.55	16.05	5.00	
31 Greene (Bath tp.)					(16)	(Organized April 15, 1910)			
32 Guernsey (Antrim)					(13)				
33 Hamilton (Anderson tp.)	21	*21					1.00		
34 Hancock	217	217					10.85		
35 Hardin	147	147	147	147	147		14.85	.14	3.54
36 Hardin (Forest)					(20)	Organized Apr. 18, 1910			
37 Harrison (Corn, fruit)					(23)				2.30
38 Henry					(32)				
39 Holmes	39	39	39	39	18		3.90		.46
40 Huron	(13)	*13	*13	*13			1.00	.02	
41 Jefferson	18	18	18	18	16		1.80		.40
42 Knox	73	79	79	146	128		18.30	8.87	1.60
43 Lake	23	25	25	25			2.46		
44 Licking	117	117	98	135	83		11.69		4.16
45 Logan	53	54					2.40		
46 Logan (Belle Center)	(43)	48	48	57			3.85	.03	
47 Madison	12	12	12	13	*13	—.30	2.60	1.08	
48 Marion	67	72	74	96			7.73		
49 Marion (Western					(29)				
50 Meigs	62	54	54	55		.02	5.63	.02	

Association	1909 First Quarter	1909 Second Quarter	1909 Third Quarter	1909 Fourth Quarter	1910 First Quarter	**Over-paid 1908	Paid 1909	Over-paid 1909	***Paid 1910
51 Mercer	90	94	50	50	137	2.88	5.00	.78	5.00
52 Montgomery	22	24	24	26			2.40		
53 Montgomery (Wayne tp.)					(48)				1.20
54 Montgomery and Miami (Stillwater Valley)					(91)				9.10
55 Morrow	18	16	22	22	22		2.00		.55
56 Muskingum	22	26	7	7	8	1.65		.09	.11
57 Noble (Jackson tp.)	20	20	20	22	23	.08	1.98	.01	.58
58 Noble, Guernsey and Muskingum					(22)				
59 Ottawa					(35)				.85
60 Paulding	90	91	91	*94		1.16	9.08	1.16	
61 Perry					(11)				1.10
62 Pickaway	62	62	62	63		6.20	—.02		
63 Preble	50	52	53	47	50	—.32	10.10	4.71	
64 Preble (Twin Valley)	(25)	25	25	25			1.88		
65 Putnam	16	24	24	24	24		2.20		.60
66 Putnam (Continental)					(42)				1.95
67 Putnam (Kalida)					(47)				
68 Ross	127					—2.92	4.53		
69 Sandusky	35	36	36	37	51		3.61		1.28
70 Seneca	*54					1.35			
71 Stark	21	24	24	*24			2.43	.10	
72 Summit	59	59	60	68			6.07	—.08	
73 Trumbull	53	53					2.66		
74 Trumbull (South)					18	(Organized April 8, 1910)			
75 Tuscarawas	12	12	12	12	6		1.20		.15
76 Union (York tp.)	20	20	20	20	20	—.12	2.12		.50
77 Van Wert	92	92	92	94	25		9.20	—.05	1.25
78 Van Wert (Venedocia)					(14)				
79 Warren	32	32	33	33	10		3.26		.25
80 Washington	16	16	26	27	27	.28	1.78	—.12	2.82
81 Wayne	113	114	118	118	99	—.04	11.61		2.37
82 Williams (Corn, grain and livestock)					(32)				
83 Williams (Edon)					(26)				
84 Wood	*32	*32	*32	*32	41	2.40			2.85
85 Wyandot					(45)	(Organized April, 1910)			6.75
Totals	2849	2704	2284	2566	2505	9.29	276.81	36.41	78.09
Number members in good standing because of having been reported the previous quarter		103	379		744				
Total members in good standing	2749	2807	2663	2566	3249				

* No report received for this quarter but dues paid in advance.
( ) Organization report, no dues required.
** Including settlements up to February 15, 1909.
*** Including settlements up to June 7, 1910.

STATEMENT OF FINANCES

RECEIPTS

Dues paid by Local Associations:		
Prior to February 15, 1909 (see 1908 Annual)	$138.65	
From February 15, 1909 to January 1, 1910	276.81	
From January 1, 1910 to June 7, 1910	78.09	
Total received from Local Associations		$493.55
Account 10-year 10-acre prize fund		20.00
*From Grain Dealers' Assoc., ac. Second An. Corn Show		65.00
Total receipts since organization		$578.55

EXPENDITURES

Account refund to contributors to 10-year 10-acre prize fund:				
Order No.	1,	Jan. 11, 1910,	J. E. Russell, Sidney	$ 1.00
"	2,	"	Jno. Cunningham, Gambier	1.00
"	3,	"	Solomon Johnson, Stryker	5.00
Amount forward				$ 7.00

* The Grain Dealers Association contributed in addition to this $65.00, the sum of $85.00 direct to the committee in charge, making their total contribution $150.00.

Brought forward		$ 7.00
Order No. 4, Jan. 11, 1910, C. H. Ganson, Urbana	$ 1.00	
" 5, " C. M. Freeman, Tippecanoe City	1.00	
" 6, " A. P. Sandles, Ottawa	1.00	
" 7, " W. H. Fisher, Columbus	1.00	
" 8, " J. T. Burnham, Berlin Heights	1.00	
" 9, " Russell Peterson, Austin	2.00	
" 10, " A. L. White, Norwich	1.00	
" 11, " H. N. Firestone, Middlebranch	1.00	
" 12, " A. B. Cross, Racine	1.00	
" 13, " Wm. Walker, Hilliard	1.00	
" 14, " D. W. Galehouse, Marshallville	1.00	
" 15, " E. R. Mathie, New Berlin	1.00	
Order No. 16, Jan. 11, 1910, Ohio Experiment Station for printing 1909 Annual and for purchase of goldenrod paper and envelopes	151.03	
Order No. 17, Jan. 17, 1910, F. H. Owen, Treasurer Committee on Institutes and Expositions, account Second Annual Corn Show	165.00	
Order No. 18, Jan. 20, 1910, E. G. Montgomery, Lincoln, Neb., expenses as judge at Second Annual Corn Show	59.00	
Total expenditure		$395.03
Balance in Association Treasury June 7, 1910		$183.52

L. H. GODDARD, State Secretary.

Wayne County, State of Ohio, ss.

L. H. Goddard being duly sworn before me the 24th day of June, A. D. 1910, certifies that the foregoing detailed statement of finances of the Ohio Corn Improvement Association is to the best of his knowedge and belief correct.

W. H. KRAMER,
Notary Public.

[SEAL]

CONSTITUTION AND BY-LAWS OF THE OHIO CORN IMPROVEMENT ASSOCIATION

Article 1—Name

The name of this organization shall be the Ohio Corn Improvement Association.

Article 2—Purpose

The purpose of this association shall be to discover, develop and introduce better methods and practices for the improvement, production and utilization of the corn plant in Ohio.

Article 3—Members

Any person over fifteen years of age interested in the purposes of this Association may become a member by the payment of the prescribed annual fee.

Article 4—Voting

The right to vote shall be limited to accredited delegates present from local Associations. The delegation from any local Association shall then be entitled to as many votes as that local Association has multiples of ten members for which it has paid dues to the State Association. Delegates present from five counties shall constitute a quorum for the transaction of business.

Article 5—Organization

The officers of this Association shall consist of a President, a Vice-President, a Secretary, a Treasurer and four District Vice-Presidents to be elected from the district which they represent. All officers shall be elected annually and shall constitute the Executive Committee of the Association.

Article 6—Meetings

The date, place and arrangement for the annual meeting and for any called meetings shall be determined by the Executive Committee without being submitted to the local Associations. Special meetings must be called upon written request of local Associations representing five counties.

Article 7—Elections

The election of officers for the ensuing year shall be held at next to the last session of the annual meeting.

Article 8—Amendments

Ammendments to this constitution may be made by a two-thirds vote at any annual meeting.

BY-LAWS

Section 1—Dues

The annual dues of all members shall be not less than twenty-five cents per year, payable in advance to the local Association. Local Associations shall pay to the State Association ten cents annually for each member on their rolls, settlements to be made at the end of each quarter. Local Associations in arrears for dues for more than one quarter shall be dropped from the rolls, but may be restored to membership by the Executive Committee by payment of all arrears.

Section 2—Officers

It shall be the duty of the President to preside at all meetings of the Association and Executive Committee, and to countersign at his discretion all orders on the Treasurer.

The Vice-President shall preside in the absence of the President.

The Secretary shall keep the records of the Association and Executive Committee. He shall receive all money due the Association, shall turn same over to the Treasurer within thirty days, and shall issue orders upon the Treasurer for the payment of expenses, when so instructed by the Executive Committee or the Association. He shall receive such remuneration as may be determined upon by the Executive Committee.

The Treasurer shall hold all moneys of the Association and pay out same upon orders from the Secretary, when properly countersigned by the President. Before entering upon his duties he shall execute a bond to the Association in such sum as may be determined upon by the Executive Committee, conditioned upon the faithful performance of said duties. He shall receive such remuneration as may be determined upon by the Executive Committie.

The several officers shall serve until their successors are elected and installed, and shall then turn over to them all books, papers, money or other matter connected with their offices. They shall make an annual report and shall perform such other duties as are ordinarily required of such officers.

She Executive Committee shall execute the instructions of the Association, shall have authority to take up any phase of work that it deems for the best interests of the Association and may call to its assistance such sub-committees as it wishes. It shall have authority to fill all vacancies.

Every action of the Executive Committee which is not submitted to the Association within three days, and except as noted in Article 6, must be submitted by mail to the secretary of each local Association, which is in good standing with the state Association within thirty days, and such action may be nullified by a majority negative vote of these Secretaries within ten days after such notice is mailed to them.

Section 3—Amendments

Amendments to these By-laws may be made by a majority vote at any annual meeting.

INDEX